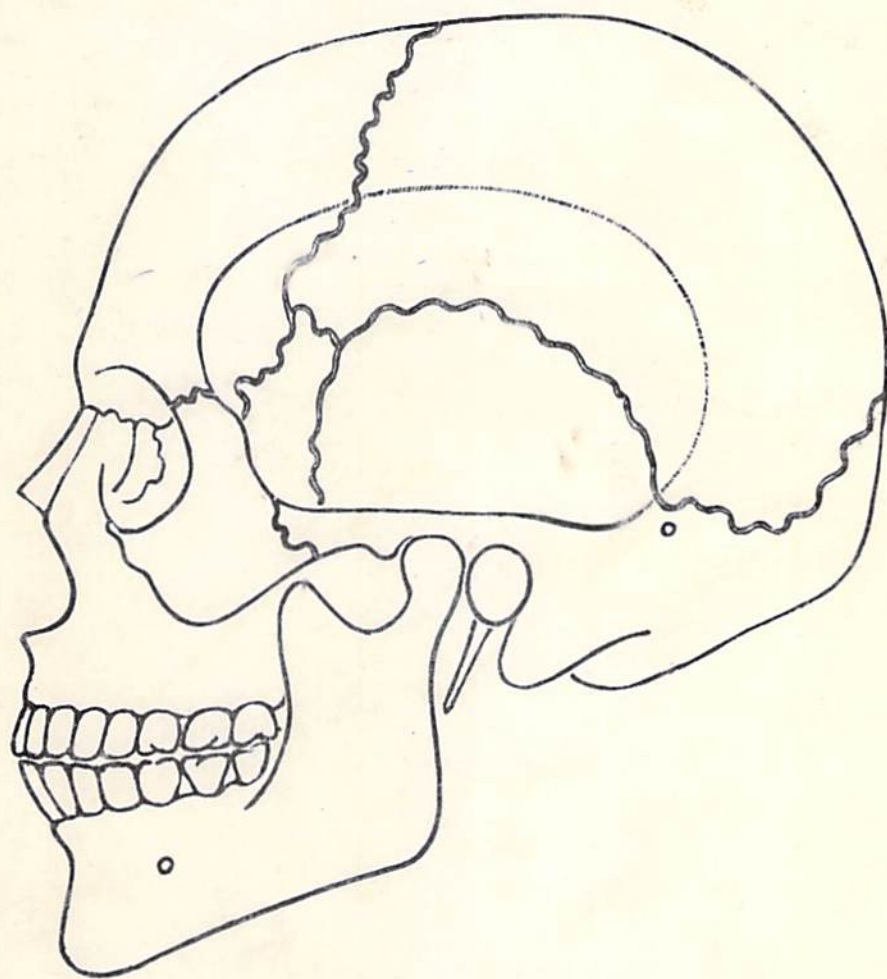


# ATLAS OF ANATOMY

HEAD & NECK



by  
FAWZI GABALLAH  
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14

# **ATLAS OF ANATOMY**

## **HEAD AND NECK**

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## **PREFACE**

This " ATLAS OF ANATOMY " contains 763 figures on the anatomy of the head and neck. Almost all the anatomical facts are illustrated in a clear way, and the diagrams are provided with concise explanatory notes.

The authors hope that this diagrammatic atlas will be helpful to the medical student as a guide to better understanding of anatomy.

Cairo, 1990

FAWZI GABALLAH

ZAIZAFON BADAWY

## OTHER BOOKS BY THE SAME AUTHORS

1. Atlas of Anatomy (other parts).
2. Atlas of Embryology.
3. Basic Embryology.
4. Basic Neuroanatomy.
5. A Summary of Anatomy (all parts).
6. Oral Questions in Anatomy.

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# BONES

# SKULL

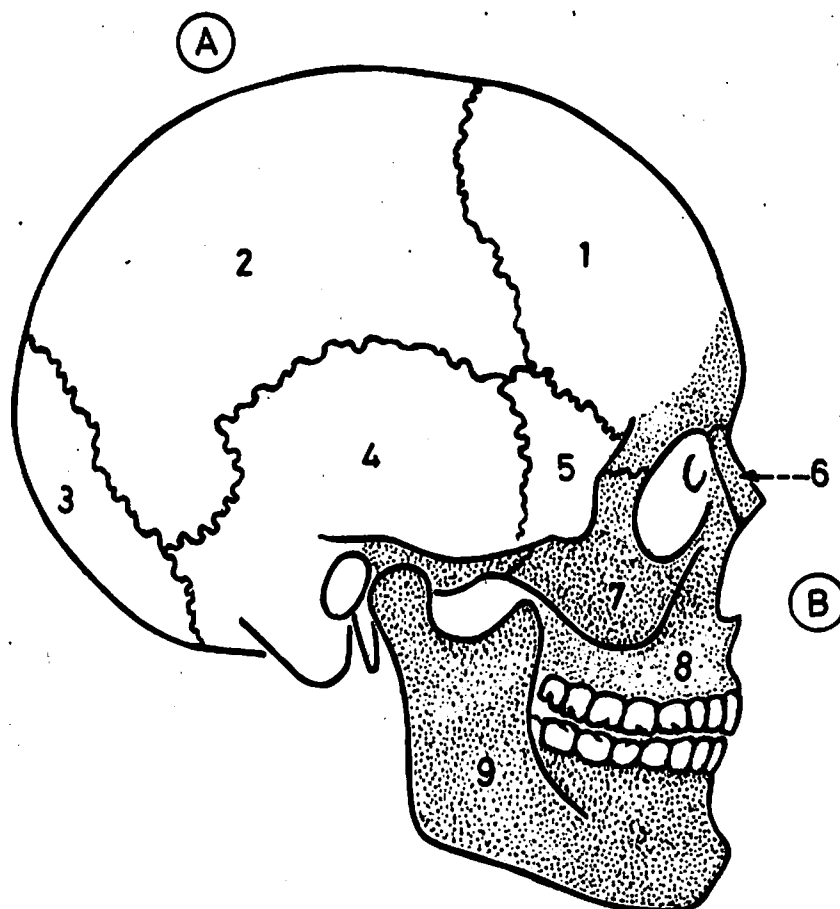


Fig.(1): PARTS OF THE SKULL  
(side view)

The skull consists of 2 main parts: calvaria (A) and facial skeleton (B). The calvaria is the part which encloses the brain, while the facial skeleton consists of the bones of the face including the mandible.

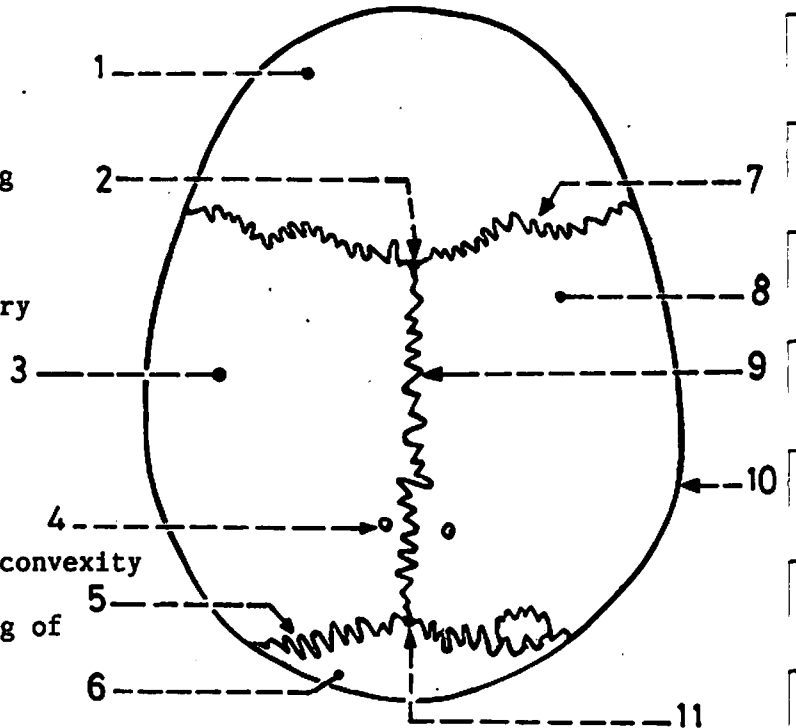
The skull as a whole consists of several bones which meet each other at irregular lines called sutures. These bones are the following as seen from the side:

1. frontal bone.
2. parietal bone.
3. occipital bone.
4. temporal bone.
5. greater wing of sphenoid bone (the rest of the bone lies in the base of the skull).
6. nasal bone.
7. zygomatic bone.
8. maxilla.
9. mandible.

# NORMA VERTICALIS (top view)

Fig.(2): NORMA VERTICALIS IN THE ADULT SKULL

1. frontal bone (anterior).
2. bregma (the point of meeting of the coronal and sagittal sutures).
3. parietal bone (left).
4. parietal foramen (an emissary foramen which transmits an emissary vein).
5. lambdoid suture.
6. occipital bone (posterior).
7. coronal suture.
8. parietal bone (right).
9. sagittal suture.
10. parietal eminence (maximum convexity of the parietal bone).
11. lambda (the point of meeting of the sagittal and lambdoid sutures).

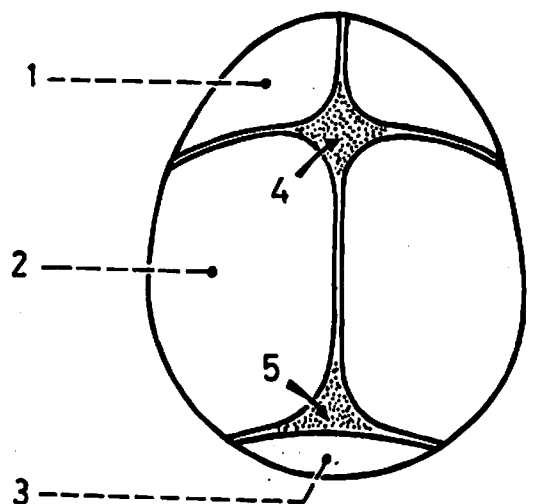


\* Note that a suture is a fibrous joint which is filled with a sutural ligament and does not allow any movement. It becomes obliterated in old age.

Fig.(3): NORMA VERTICALIS IN THE FOETAL SKULL

In the skull of the foetus the site of the bregma is occupied by the anterior fontanelle, and the site of the lambda is occupied by the posterior fontanelle.

1. frontal bone.
2. parietal bone.
3. occipital bone.
4. anterior fontanelle (a gap filled with a membrane which ossifies by 18 months after birth).
5. posterior fontanelle (a gap filled with a membrane which ossifies 3 months after birth).





NORMA FRONTALIS (anterior view)

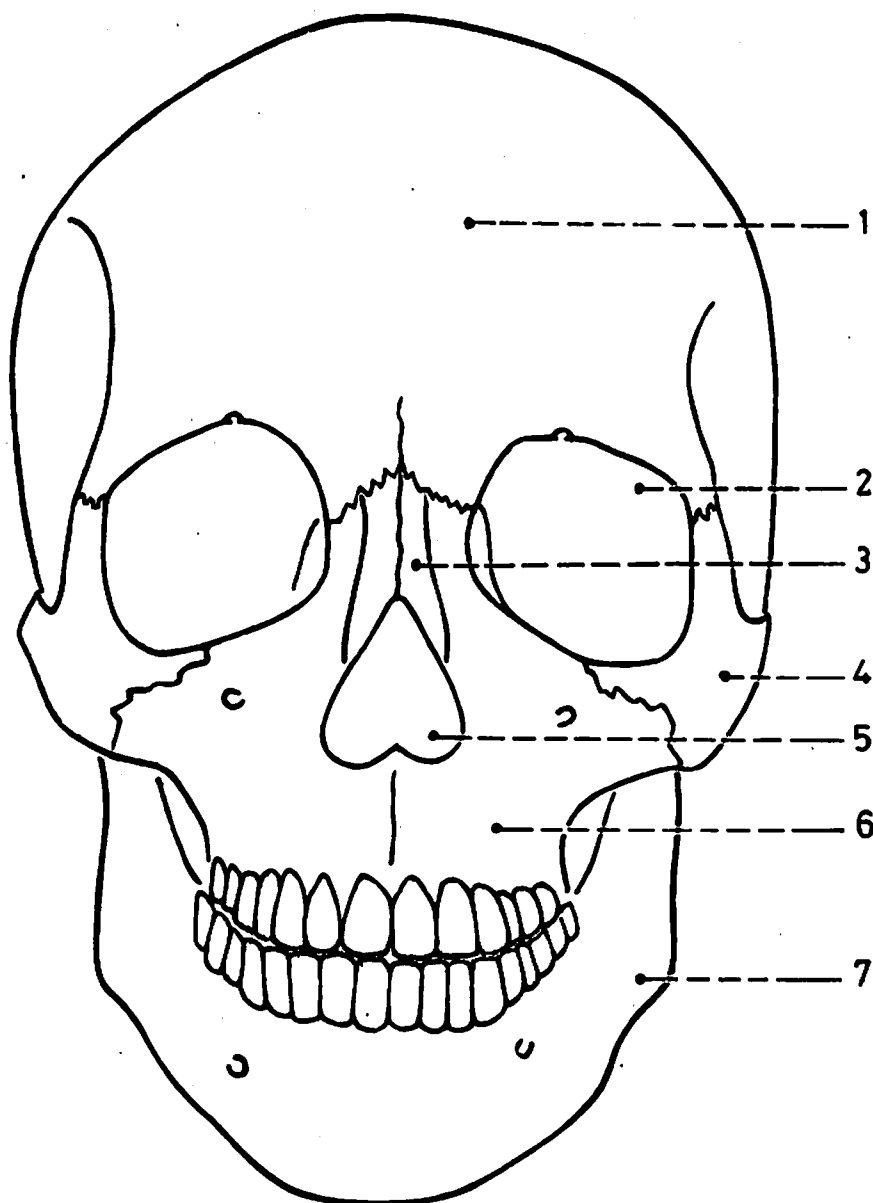


Fig.(4): BONES SEEN IN THE NORMA FRONTALIS

1. frontal bone.
2. orbit.
3. nasal bone.
4. zygomatic bone.
5. anterior nasal aperture.
6. maxilla.
7. mandible.

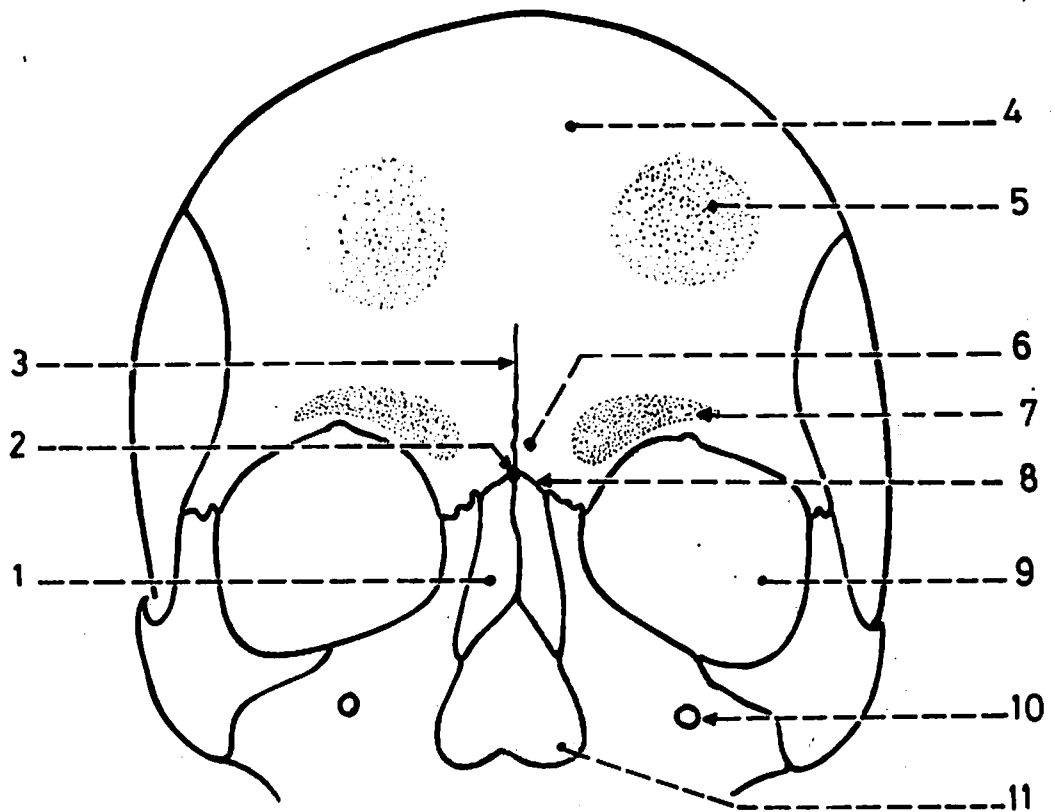


Fig.(5): UPPER PART OF NORMA FRONTALIS

1. nasal bone.
2. nasion (the point of meeting of the internasal suture and the fronto-nasal suture).
3. metopic suture (in 10% of skulls).
4. frontal bone (forms the forehead).
5. frontal eminence (a slight rounded elevation).
6. glabella (a median elevation between the 2 superciliary arches).
7. superciliary arch (curved elevation just above the medial part of the supra-orbital margin).
8. frontonasal suture (between the frontal and nasal bones).
9. orbit.
10. infra-orbital foramen.
11. anterior nasal aperture.

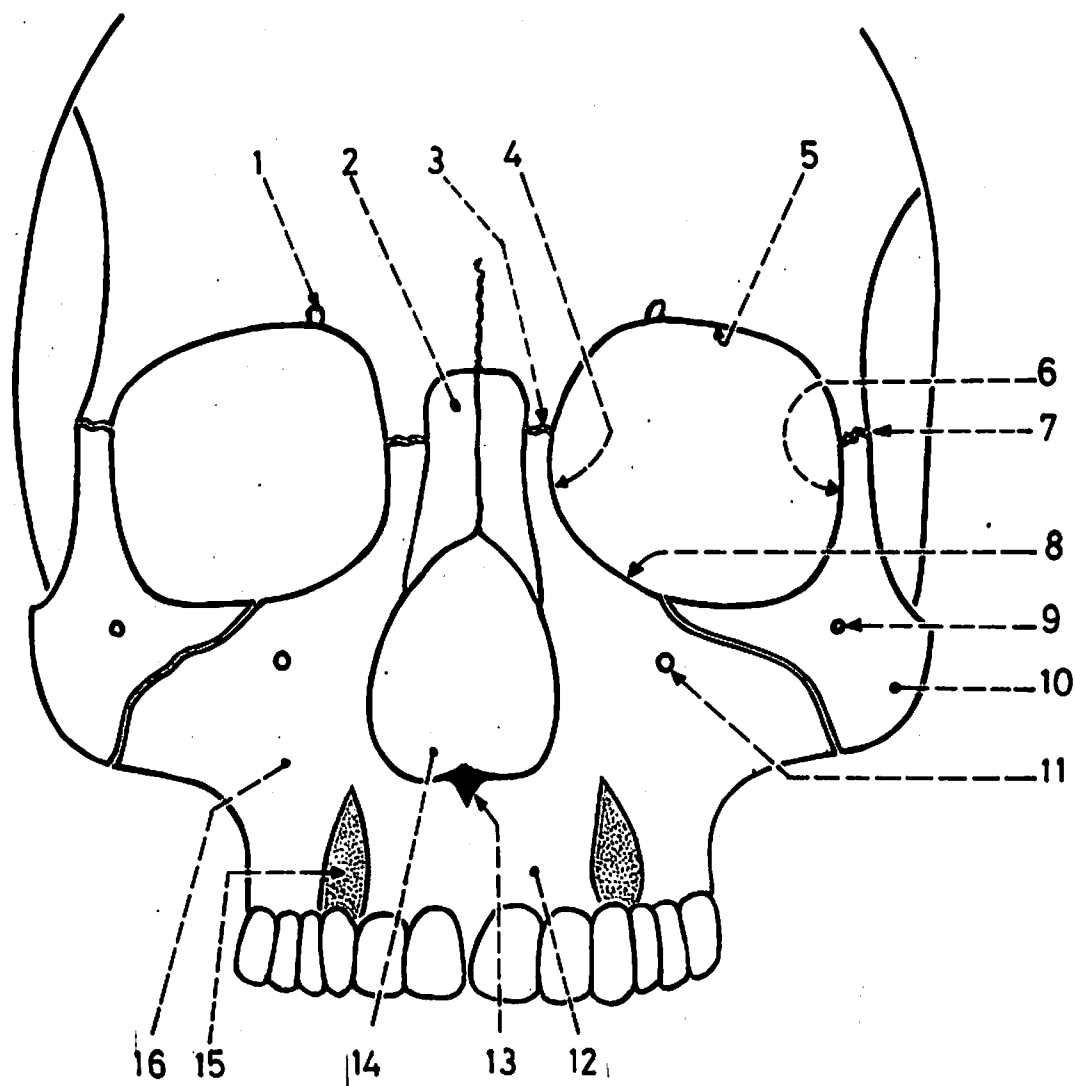


Fig.(6): LOWER PART OF NORMA FRONTALIS

1. supra-orbital foramen or notch (on the supra-orbital margin).
2. nasal bone.
3. fronto-maxillary suture (between the maxillary process of the frontal bone and frontal process of the maxilla).
4. medial orbital margin.
5. supra-orbital margin.
6. lateral orbital margin.
7. fronto-zygomatic suture (between zygomatic process of the frontal bone and frontal process of the zygomatic bone).
8. inferior orbital margin.
9. zygomatico-facial foramen.
10. zygomatic bone.
11. infra-orbital foramen (1 cm below the infra-orbital margin).
12. incisive fossa (medial to the canine eminence).
13. anterior nasal spine.
14. anterior nasal aperture (piriform opening).
15. canine eminence (produced by the root of the canine tooth).
16. canine fossa (lateral to the canine eminence).

THE ORBIT

Fig.(7): SHAPE OF THE ORBIT

The orbit is a pyramidal cavity having a base, apex and 4 walls (roof, floor, medial wall and lateral wall). Its axis passes forwards and laterally from the apex to the centre of the base.

1. medial wall (parallel to the midline).
2. base of the orbit (the orbital opening).
3. lateral wall (oblique).
4. apex (corresponds to the optic canal).

(a) axis of the orbit.

(b) median plane.

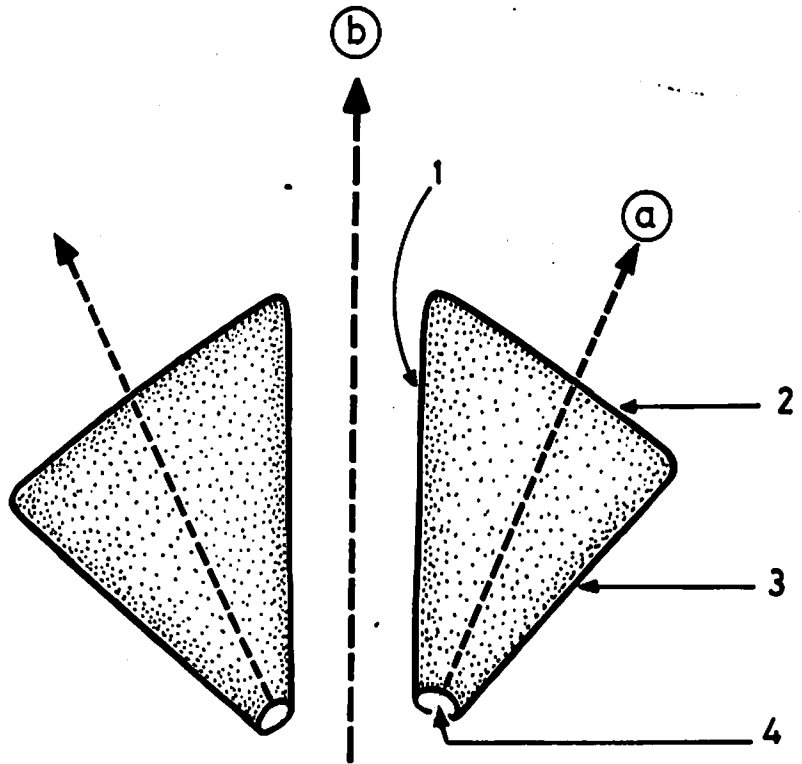


Fig.(8): BOUNDARIES OF THE ORBITAL OPENING

The orbital opening has 4 margins: superior, lateral, inferior and medial.

1. supra-orbital margin: formed wholly by the frontal bone and shows the supra-orbital notch or foramen.
2. lateral margin: formed by the frontal process of the zygomatic bone (below) and the zygomatic process of the frontal bone (above).
3. infra-orbital margin: formed by the maxilla (medially) and the zygomatic bone (laterally).
4. medial margin: formed by the frontal process of the maxilla (below) and the maxillary process of the frontal bone (above). It is sharp in its lower  $\frac{1}{2}$  where it forms the anterior boundary of the lacrimal fossa.

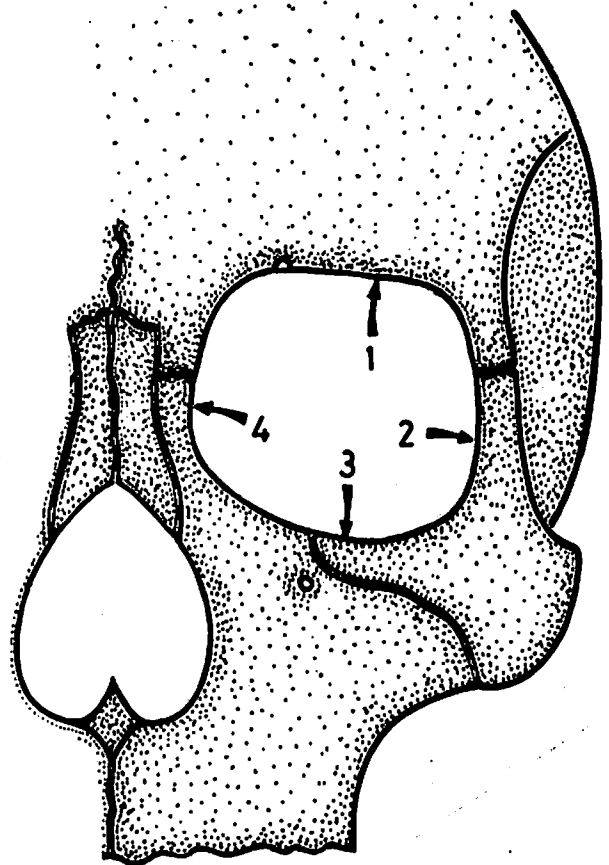




Fig.(9): MAIN RELATIONS OF THE ORBIT

The orbit is related mainly to the following structures:

- (a) anterior cranial fossa (above).
- (b) temporal fossa (laterally).
- (c) maxillary air sinus (below).
- (d) nasal cavity (medially).

\* Note that the orbit is related behind to the middle cranial fossa.

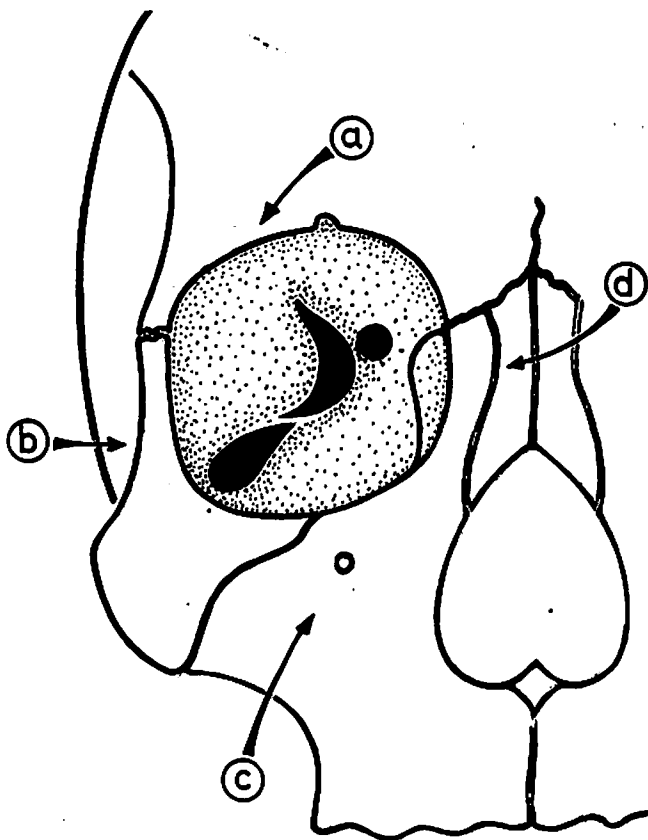


Fig.(10): OPTIC CANAL AND ORBITAL FISSURES

The optic canal lies at the apex of the orbit just medial to the superior orbital fissure.

The superior orbital fissure lies between the roof and lateral wall, while the inferior orbital fissure lies between the floor and lateral wall.

1. inferior orbital fissure (communicates the orbit with the infratemporal and pterygopalatine fossae).
2. lateral wall of the orbit.
3. superior orbital fissure (communicates the orbit with the middle cranial fossa).
4. roof of the orbit.
5. optic canal (communicates the orbit with the middle cranial fossa).
6. floor of the orbit.

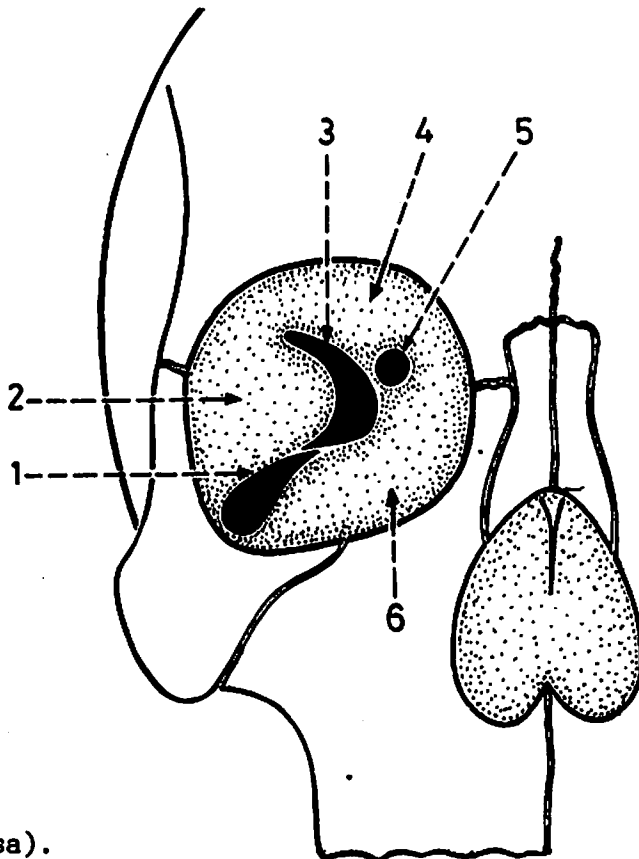


Fig.(11): MEDIAL WALL OF THE ORBIT

It is the thinnest wall and is formed by the following bones from before backwards: frontal process of maxilla, lacrimal bone, orbital plate of ethmoid bone and body of the sphenoid bone.

1. lacrimal bone (grooved anteriorly by the lacrimal groove).
2. crest of lacrimal bone (forms the posterior boundary of the lacrimal groove).
3. frontal process of maxilla (sharp and forms the anterior boundary of the lacrimal groove).
4. anterior ethmoidal foramen.
5. posterior ethmoidal foramen.
6. body of sphenoid (most posterior part).
7. orbital plate of ethmoid bone (very thin and separates the orbit from the ethmoidal sinuses).

\* Note that the lacrimal groove lodges the lacrimal sac.

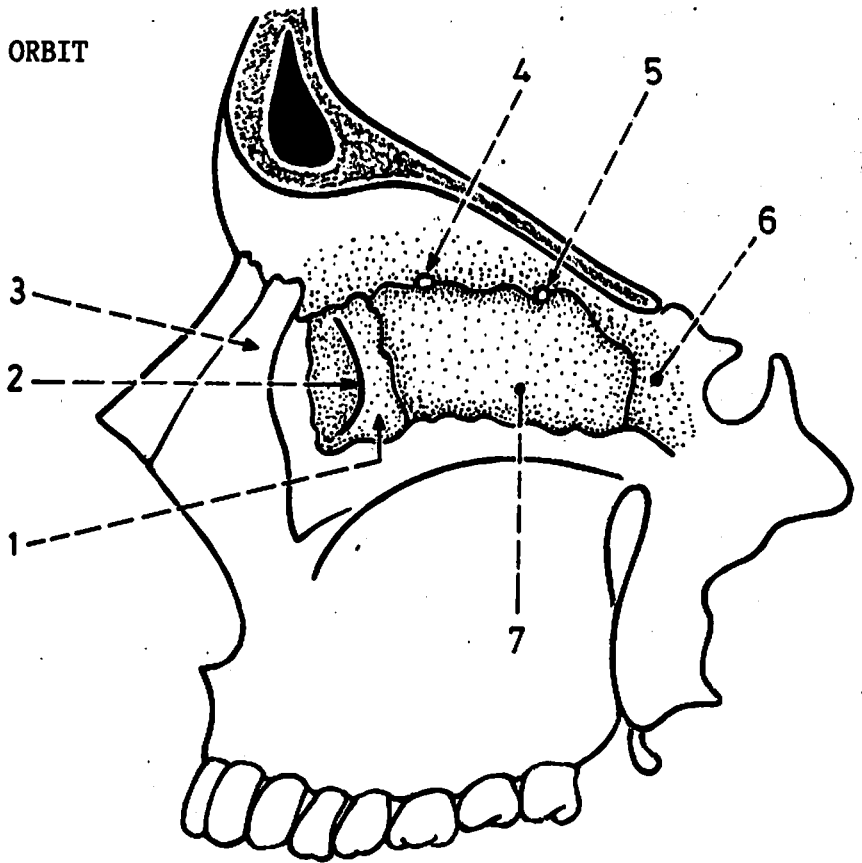
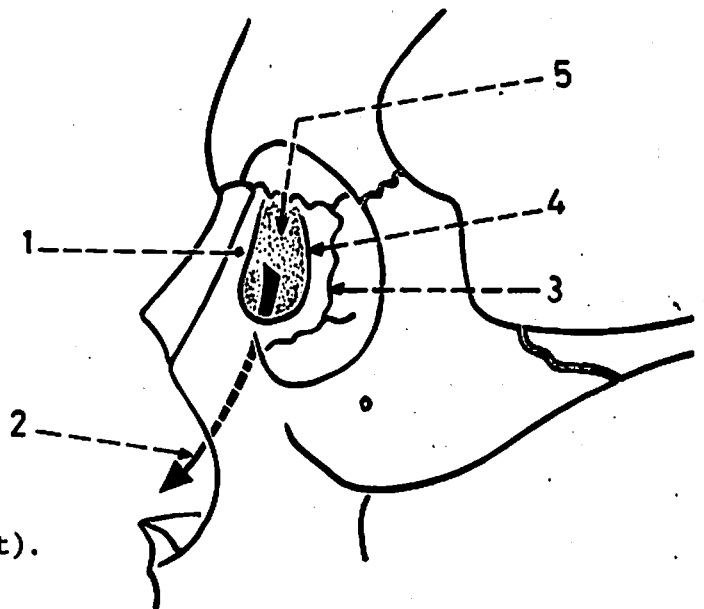


Fig.(12): LACRIMAL GROOVE

The lacrimal groove lodges the lacrimal sac and communicates with the nasal cavity by the nasolacrimal canal. It is bounded in front by the anterior lacrimal crest and behind by the posterior lacrimal crest.

1. frontal process of maxilla (forms the anterior lacrimal crest).
2. arrow in the nasolacrimal canal.
3. posterior border of lacrimal bone.
4. crest of lacrimal bone (forms the posterior lacrimal crest).
5. lacrimal groove.



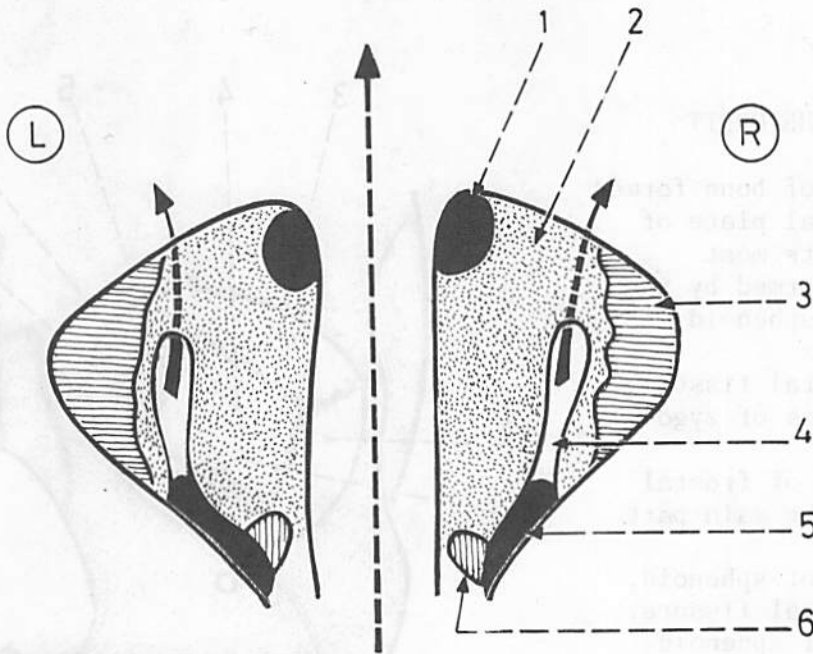


Fig.(13): FLOOR OF THE ORBIT

It is formed by the orbital plate of the maxilla, zygomatic bone and orbital process of the palatine bone. It shows the infra-orbital groove and infra-orbital canal.

1. opening of the nasolacrimal canal (anteromedial).
2. orbital plate of maxilla (main part of the floor and separates the orbit from the maxillary air sinus).
3. zygomatic bone (anterolateral part of the floor).
4. infra-orbital groove (leads anteriorly to the infra-orbital canal which opens on the surface by the infra-orbital foramen).
5. inferior orbital fissure (separates the floor from the lateral wall).
6. orbital process of the palatine bone (forms the most posterior part of the floor)

Fig.(14): LATERAL WALL OF THE ORBIT

It is the thickest wall and is formed by the greater wing of sphenoid (posteriorly) and frontal process of zygomatic bone (anteriorly). It is separated from the roof by the superior orbital fissure and from the floor by the inferior orbital fissure.

1. inferior orbital fissure.
2. greater wing of sphenoid (forms the posterior part).
3. superior orbital fissure.
4. orbital plate of frontal bone.
5. frontal process of zygomatic bone (forms the anterior part).
6. zygomatico-facial and zygomatico-temporal foramina.

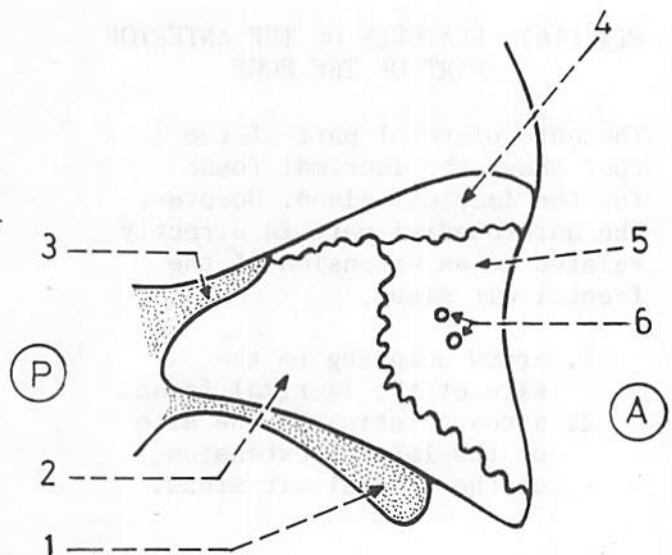


Fig.(15): ROOF OF THE ORBIT

It is a thin plate of bone formed mainly by the orbital plate of the frontal bone. Its most posterior part is formed by the lesser wing of the sphenoid.

1. inferior orbital fissure.
2. frontal process of zygomatic bone.
3. orbital plate of frontal bone (forms the main part of the roof).
4. greater wing of sphenoid.
5. superior orbital fissure.
6. lesser wing of sphenoid (forms the most posterior part of the roof).
7. optic canal.

\* Note that the lesser wing of sphenoid forms the most posterior part of the roof, and that the orbital process of palatine bone forms the most posterior part of the floor and that the body of sphenoid forms the most posterior part of the medial wall (all are small contributions).

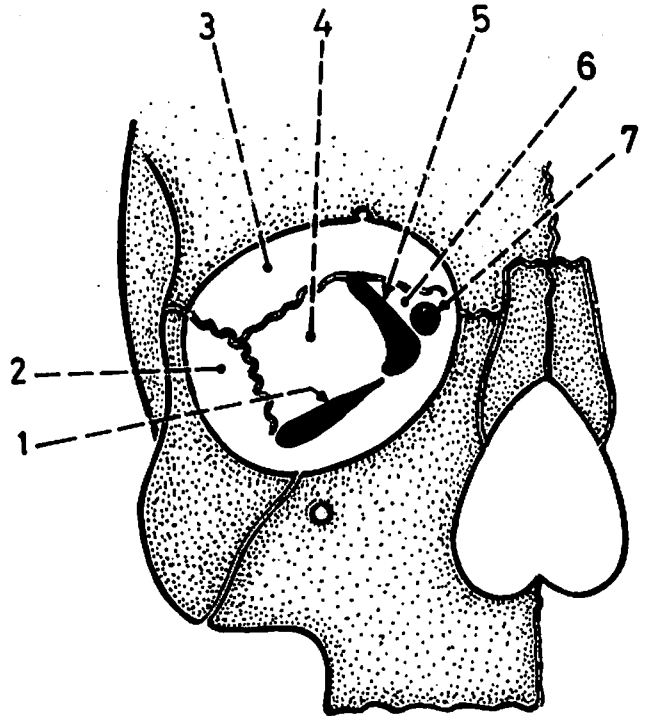
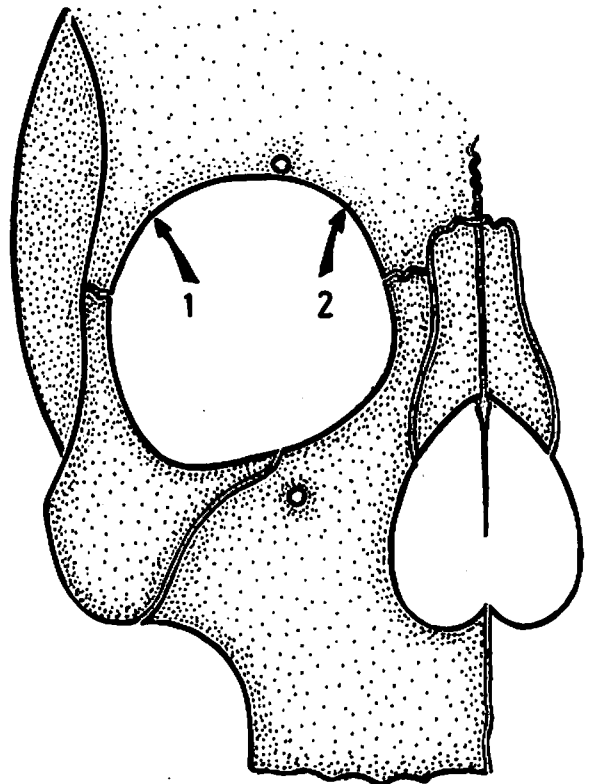


Fig.(16): FEATURES OF THE ANTERIOR PART OF THE ROOF

The anterolateral part of the roof shows the lacrimal fossa for the lacrimal gland. However, the anteromedial part is directly related to an extension of the frontal air sinus.

1. arrow pointing to the site of the lacrimal fossa.
2. arrow pointing to the site of the lateral extension of the frontal air sinus.





NORMA OCCIPITALIS (posterior view)

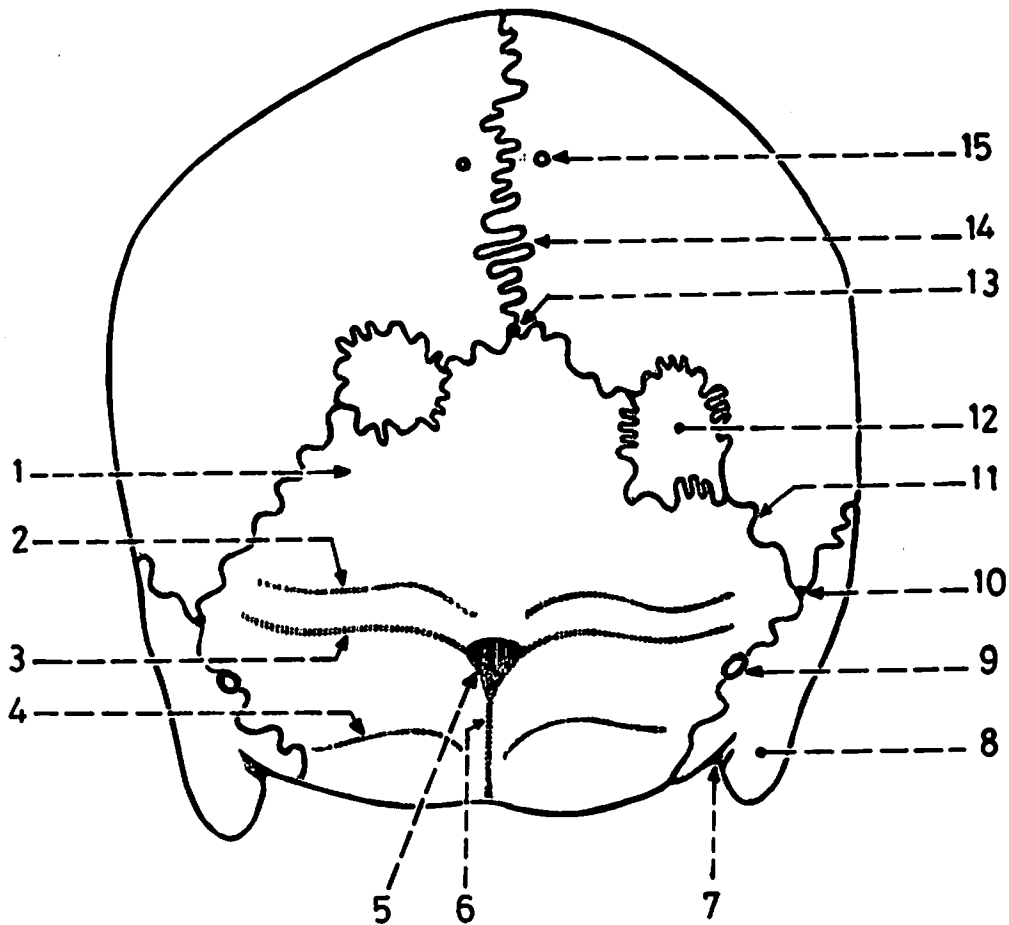


Fig.(17): GENERAL FEATURES OF NORMA OCCIPITALIS

1. squamous part of occipital bone.
2. highest nuchal line (lies 1 cm above the superior nuchal line and is not always present).
3. superior nuchal line (on each side of the external occipital protuberance).
4. inferior nuchal line (extends laterally from the midpoint of the external occipital crest).
5. external occipital protuberance (its tip is called the inion).
6. external occipital crest (a median ridge extending from the external occipital protuberance to the foramen magnum).
7. mastoid notch (deep to the mastoid process).
8. mastoid process.
9. mastoid foramen (an emissary foramen).
10. asterion (the point of meeting of the lambdoid suture, occipitomastoid and parietomastoid sutures).
11. lambdoid suture.
12. sutural bone (a small separate bone commonly present along the lambdoid suture).
13. lambda (the point of meeting of the sagittal and lambdoid sutures).
14. posterior part of the sagittal suture.
15. parietal foramen.

Fig.(18): PARTICULAR FEATURES OF NORMA OCCIPITALIS

1. epicranial aponeurosis.
2. origin of occipital belly of occipito-frontalis (may arise from the superior nuchal line).
3. insertion of sterno-mastoid.
4. insertion of longissimus capitis.
5. insertion of splenius capitis.
6. origin of trapezius.
7. ligamentum nuchae.

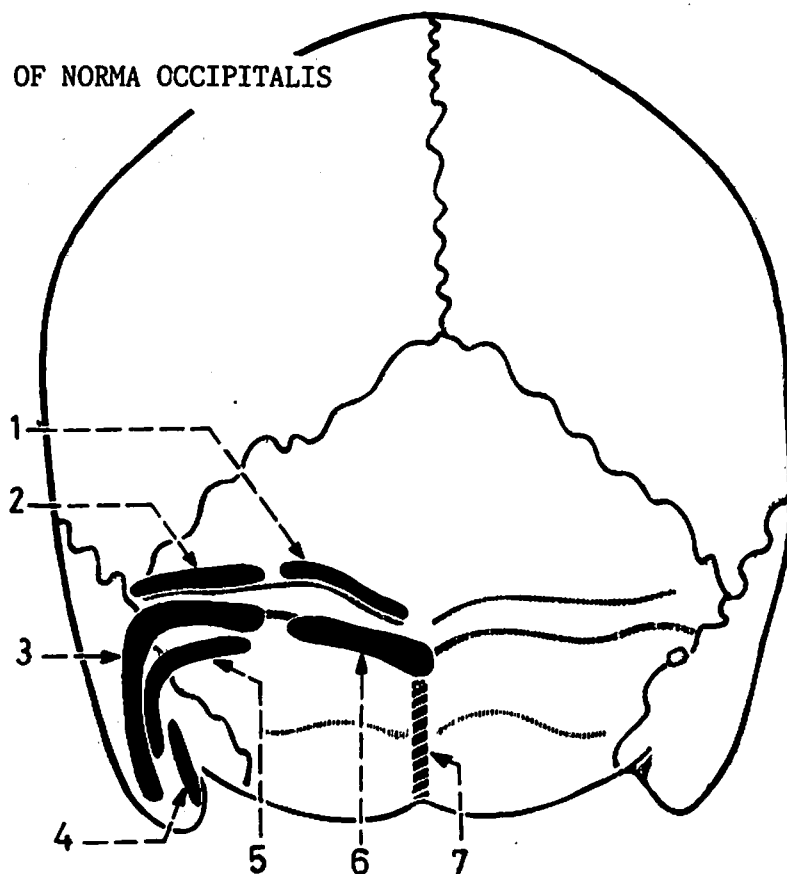
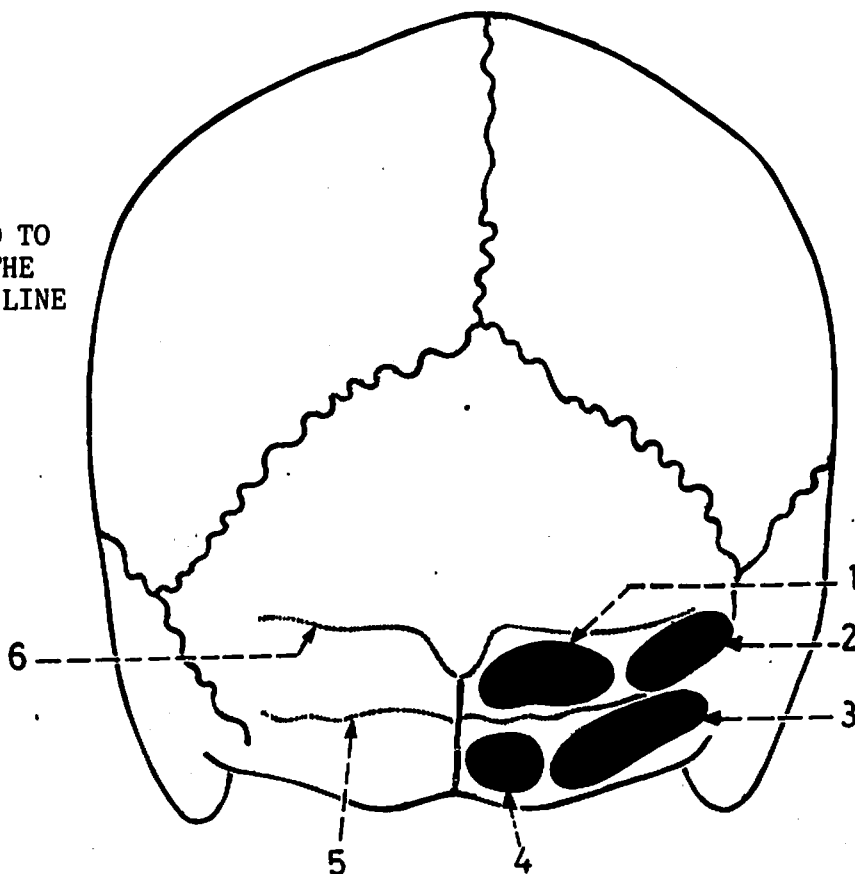


Fig.(19): MUSCLES ATTACHED TO THE AREA BELOW THE SUPERIOR NUCHAL LINE

1. insertion of semispinalis capitis.
2. insertion of superior oblique.
3. insertion of rectus capitis posterior major.
4. insertion of rectus capitis posterior minor.
5. inferior nuchal line.
6. superior nuchal line.



NORMA LATERALIS (lateral view)

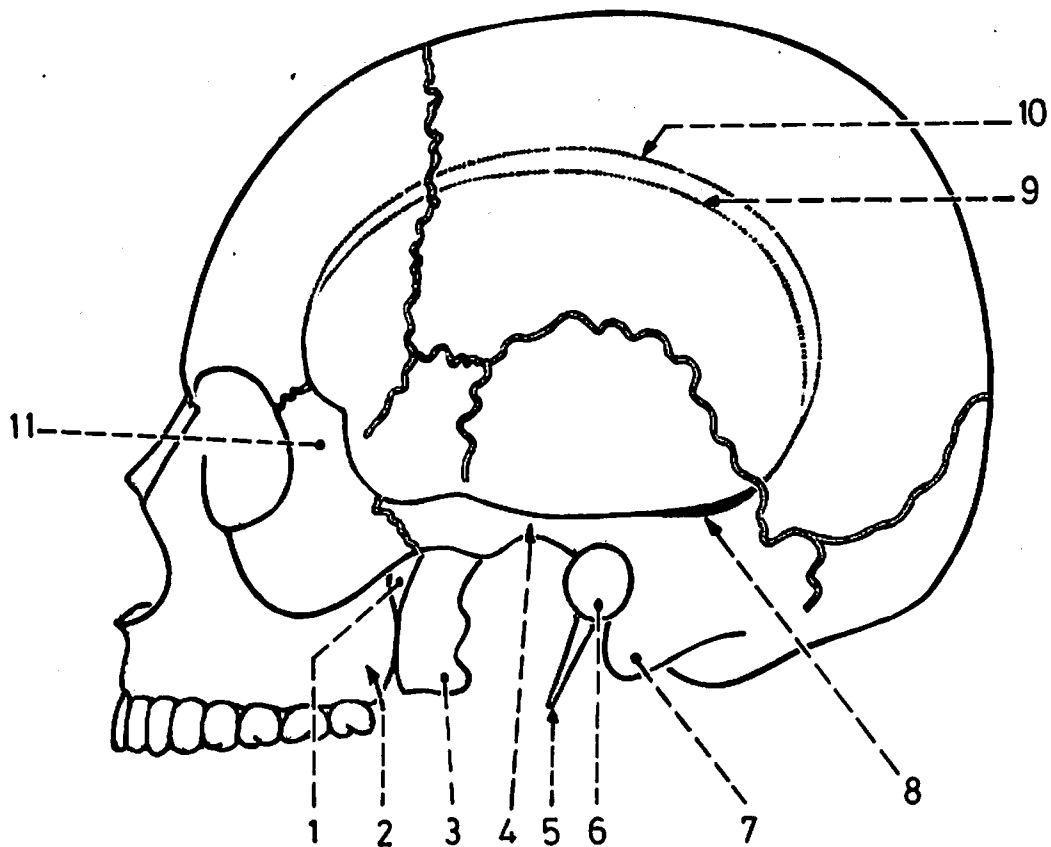


Fig.(20): GENERAL FEATURES OF NORMA LATERALIS

The norma lateralis is divided by the zygomatic arch into 2 fossae: temporal fossa above the arch and infratemporal fossa below the arch.

1. pterygopalatine fossa.
2. back of the maxilla.
3. lateral pterygoid plate.
4. zygomatic arch.
5. styloid process.
6. external acoustic (auditory) meatus.
7. mastoid process.
8. supramastoid crest.
9. inferior temporal line.
10. superior temporal line.
11. frontal process of zygomatic bone.

- \* The zygomatic arch is formed by 2 bones: temporal process of zygomatic bone and zygomatic process of temporal bone. The zygomatic process of temporal bone is called the zygoma.
- \* The temporal fossa is bounded by: frontal process of zygomatic bone, temporal line, supramastoid crest and zygomatic arch.

Fig.(21): TEMPORAL FOSSA

It is the part of the norma lateralis above the zygomatic arch. Its floor is formed by 4 bones: frontal bone, parietal bone, squamous part of temporal bone and greater wing of sphenoid. These bones meet each other at an H-shaped suture called pterion.

- (a) temporal fossa.  
(b) infratemporal fossa.

1. parietal bone.
2. squamous part of temporal bone.
3. greater wing of sphenoid.
4. pterion (H-shaped suture).
5. frontal bone.

\* The infratemporal fossa is the part of the norma lateralis below the zygomatic arch.

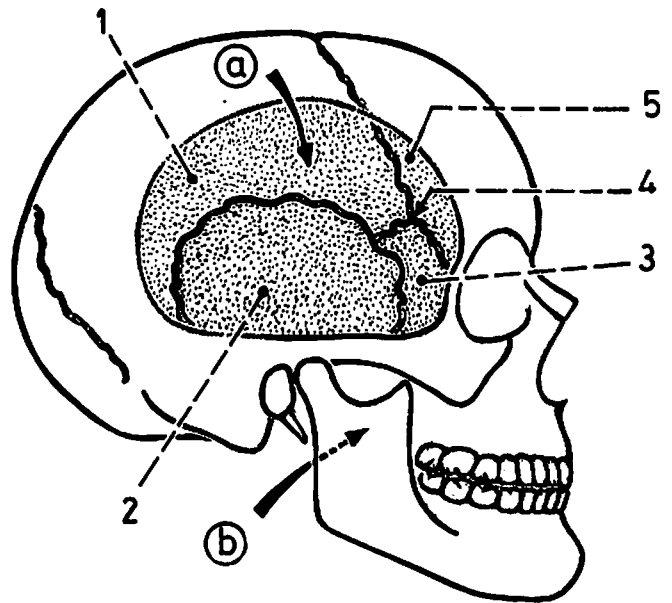


Fig.(22): PTERION

It is the area of meeting of 4 bones where they form an H-shaped suture. It is an important landmark to the anterior branch of the middle meningeal artery.

1. line of the anterior branch of the middle meningeal artery (just behind and parallel to the coronal suture).
2. coronal suture.
3. area of the pterion.

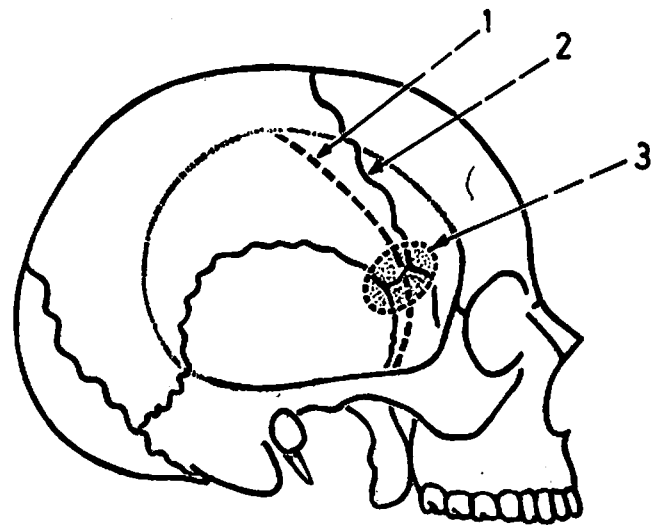


Fig.(23): SURFACE ANATOMY OF THE PTERION

The centre of the pterion lies 4 cm above the zygomatic arch (1) and 4 cm behind the fronto-zygomatic suture in the lateral margin of the orbit (2). This suture can easily be felt under the skin.

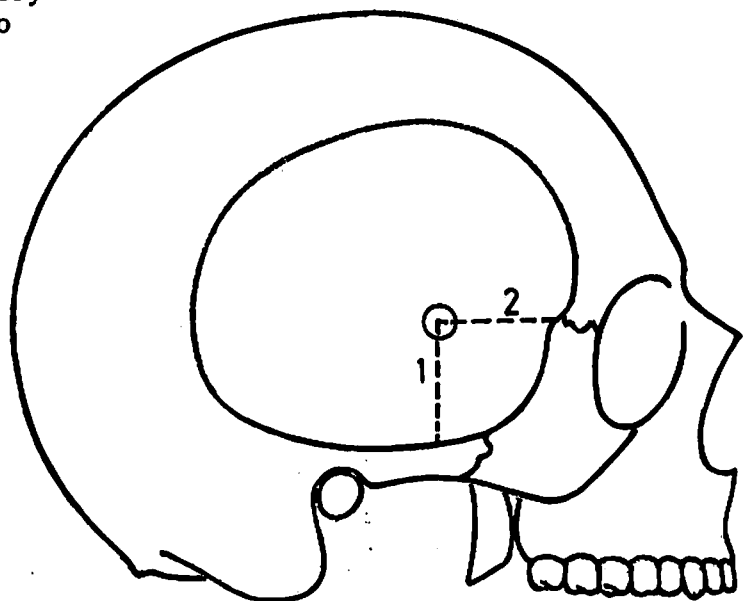


Fig.(24): SUPRAMEATAL TRIANGLE

It is the triangle just above the external acoustic meatus and forms the lateral wall of the mastoid antrum.

1. zygoma (zygomatic process of temporal bone).
2. external acoustic meatus (below and in front of the triangle).
3. styloid process.
4. mastoid process.
5. vertical line tangent to the posterior margin of the meatus (behind the triangle).
6. suprameatal triangle.
7. supramastoid crest (forms the upper boundary of the triangle).
8. squamous part of temporal bone.

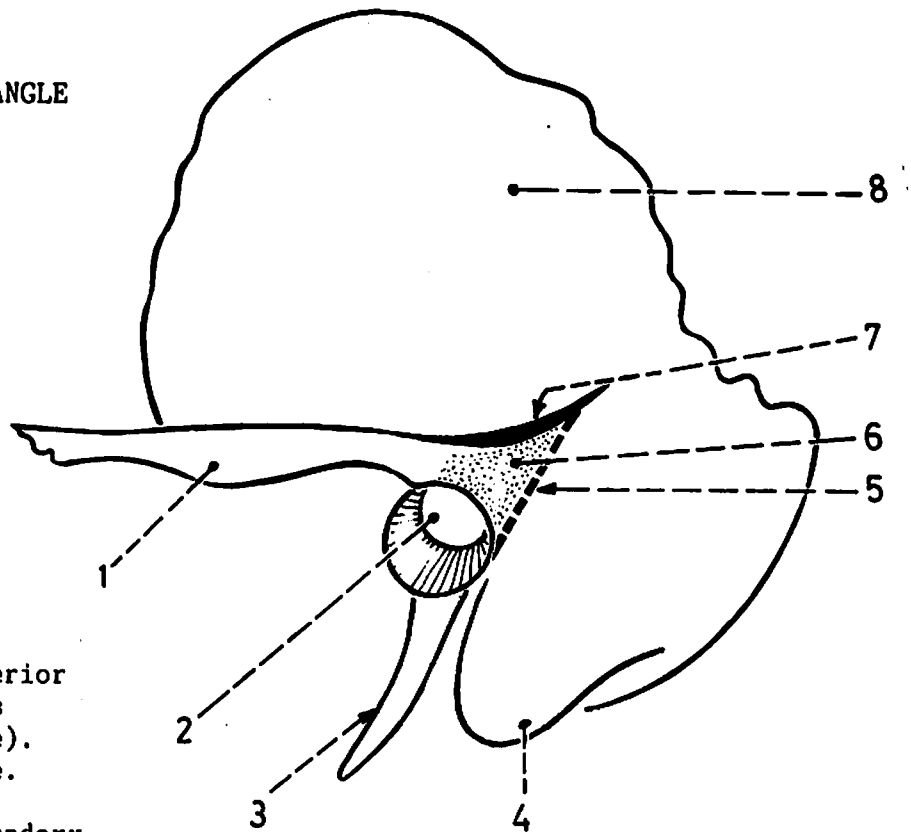


Fig.(25): COMMUNICATIONS OF THE INFRATEMPORAL FOSSA

The infratemporal fossa communicates with the following:

1. temporal fossa (through the gap deep to the zygomatic arch).
2. pterygopalatine fossa (through the pterygo-maxillary fissure).
3. orbit (through the inferior orbital fissure).

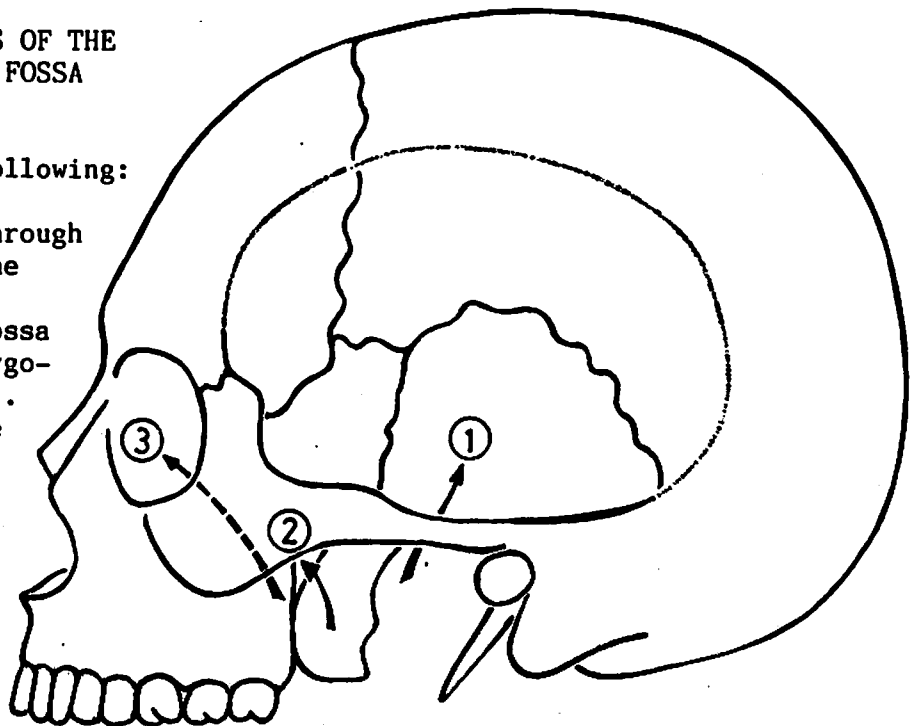


Fig.(26): ANTERIOR AND MEDIAL WALLS OF INFRATEMPORAL FOSSA

The anterior wall is formed by the back of the maxilla, while the medial wall is formed by the lateral pterygoid plate which is separated from the back of the maxilla by the pterygomaxillary fissure.

1. pterygomaxillary fissure (leads to the pterygo-palatine fossa).
2. lateral pterygoid plate (forms the medial wall of the infratemporal fossa).
3. lips of the pterygomaxillary fissure.
4. back of the maxilla (forms the anterior wall of the infratemporal fossa).

\* Note that the lateral wall of the fossa is formed by the ramus of the mandible. It has no posterior wall.

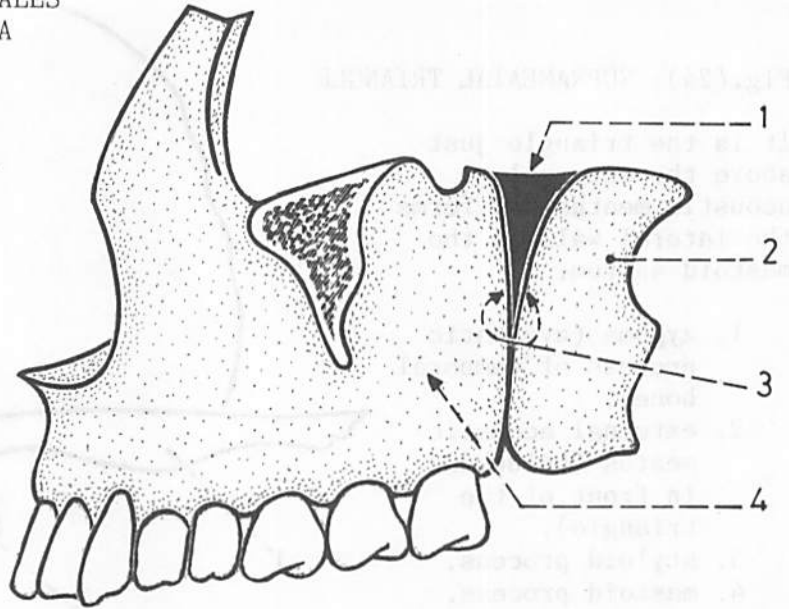


Fig.(27): ROOF OF INFRATEMPORAL FOSSA

The roof of the fossa is a part of the base of the skull and is formed mainly by the infratemporal surface of the greater wing of the sphenoid. This surface is limited laterally by the infratemporal crest and perforated medially by the foramen ovale and foramen spinosum.

1. spine of the sphenoid.
2. foramen spinosum.
3. foramen ovale.
4. infratemporal surface of the greater wing of sphenoid.
5. inferior orbital fissure.
6. temporal surface of the greater wing of sphenoid.
7. infratemporal crest.
8. squamous part of temporal bone.
9. articular eminence.
10. mandibular fossa.
11. external acoustic meatus.

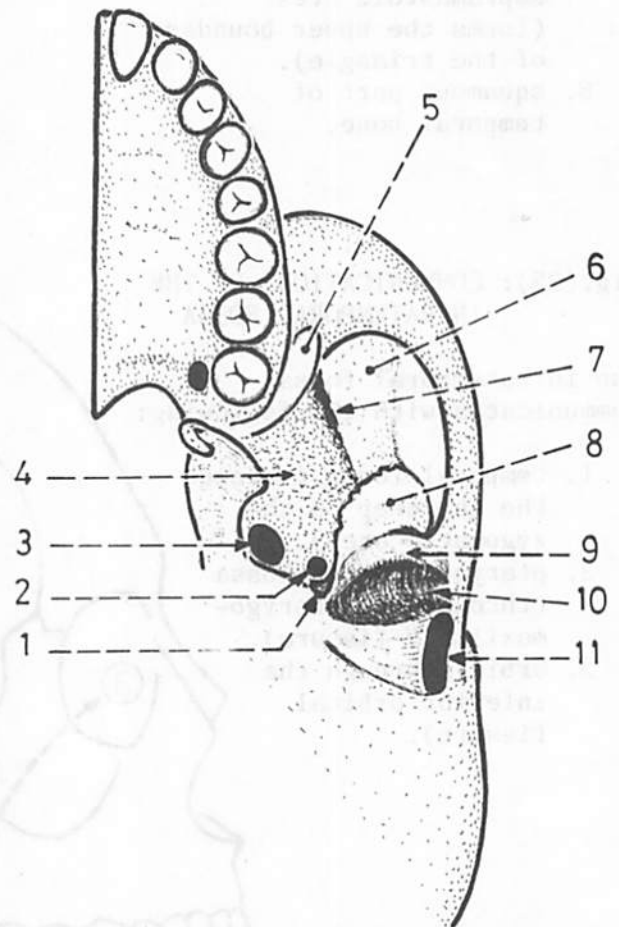


Fig.(28): PARTICULAR FEATURES  
OF THE SIDE OF THE SKULL  
AND MANDIBLE

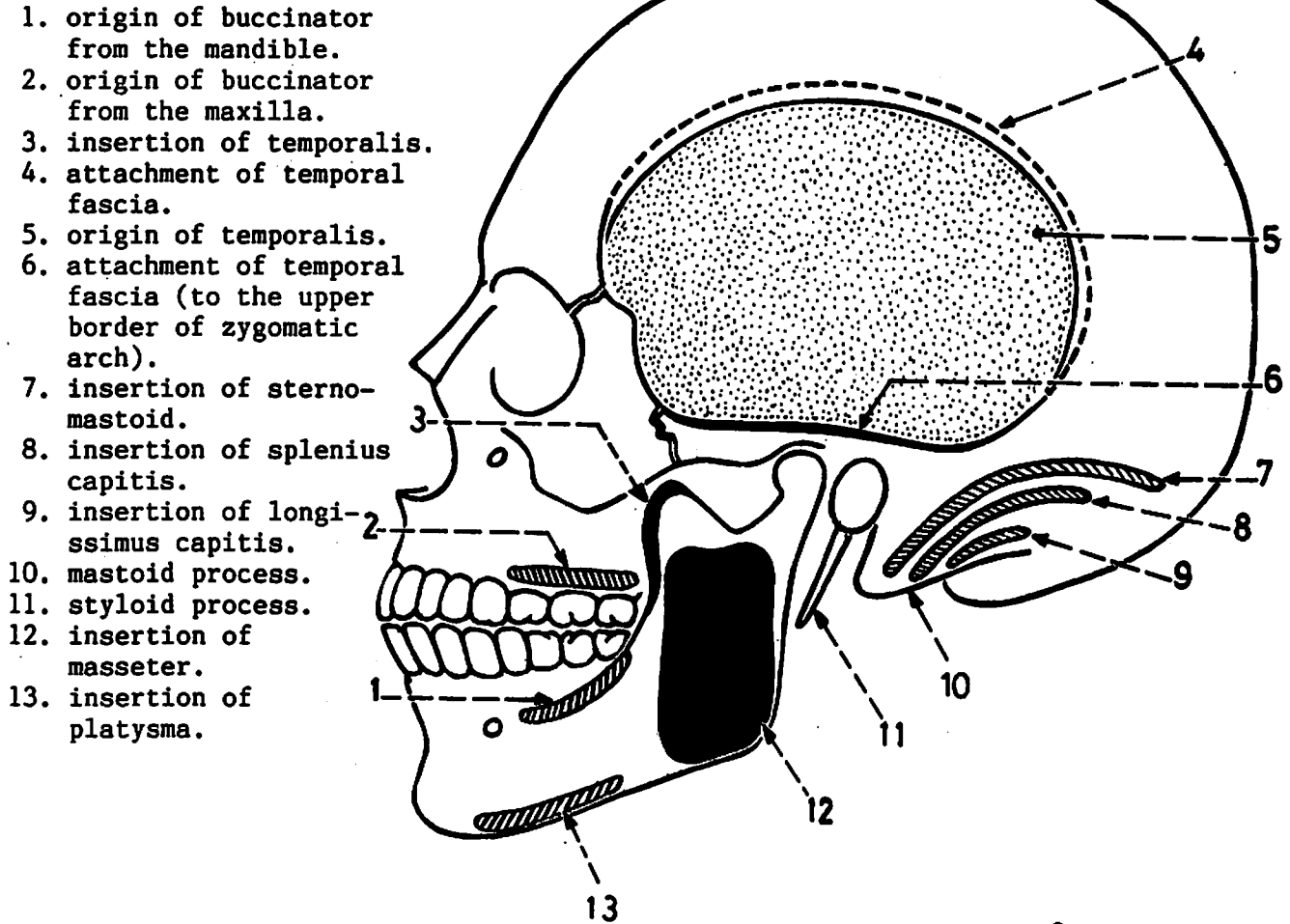
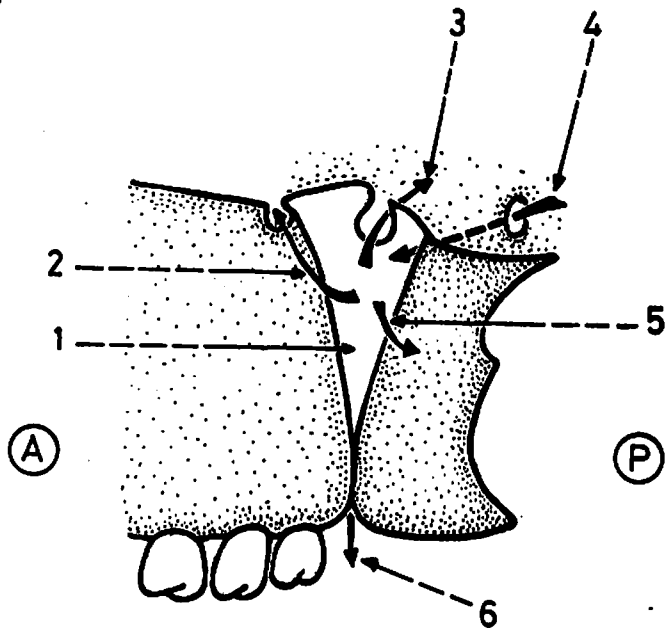


Fig.(29): PTERYGOPALATINE FOSSA

It is a small pyramidal space situated behind the maxilla and communicates with the infratemporal fossa through the pterygomaxillary fissure. It also communicates with the orbit through the inferior orbital fissure.

1. pterygopalatine fossa.
2. arrow leading to the orbit through the inferior orbital fissure.
3. arrow leading to the nasal cavity through the sphenopalatine foramen.
4. arrow passing through the foramen rotundum to enter the fossa.
5. arrow passing through the pterygomaxillary fissure.
6. arrow passing through the greater palatine canal.

\* The fossa receives also the openings of the pterygoid and palatovaginal canals (not seen in the diagram).



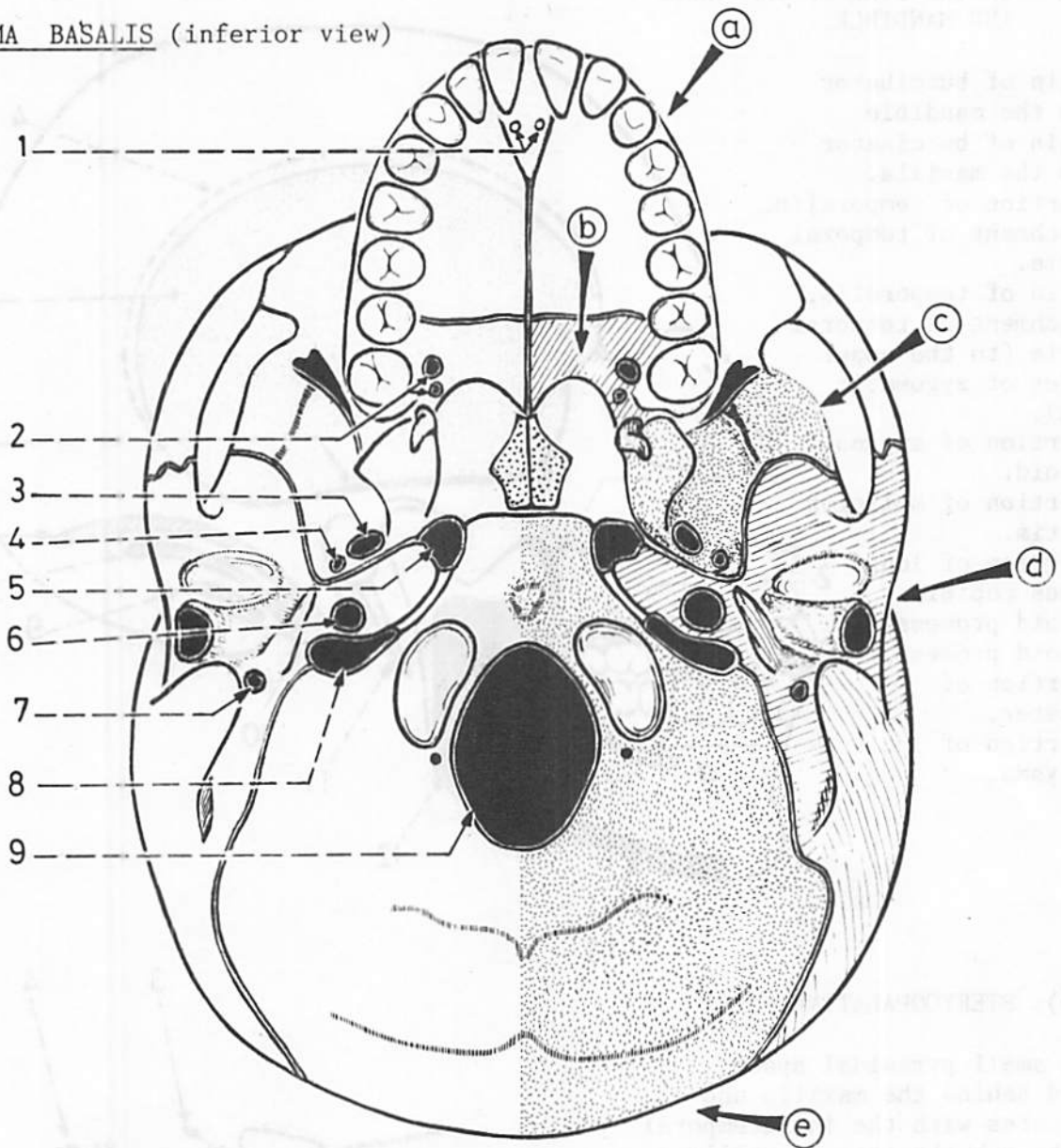
NORMA BASALIS (inferior view)

Fig.(30): BONES AND FORAMINA SEEN IN THE BASE OF THE SKULL

The main bones forming the base of the skull are: maxilla (a), palatine bone (b), sphenoid bone (c), temporal bone (d) and occipital bone (e). The sphenoid and occipital bones are single while the other bones of the base are bilateral.

The main foramina in the base of the skull are as follows:

1. incisive foramina.
2. greater and lesser palatine foramina.
3. foramen ovale.
4. foramen spinosum.
5. foramen lacerum.
6. carotid foramen.
7. stylomastoid foramen.
8. jugular foramen.
9. foramen magnum.



Fig.(31): ANTERIOR PART OF THE  
BASE OF THE SKULL

This part is formed by the hard palate and the alveolar arch. The hard palate is formed by the palatine processes of the 2 maxillae (in front) and the horizontal plates of the 2 palatine bones (behind).

1. incisive fossa.
2. incisive foramen.
3. palatine process of the maxilla.
4. intermaxillary suture.
5. groove for the greater palatine vessels.
6. palatomaxillary suture.
7. greater palatine foramen.
8. lesser palatine foramen.
9. palatine crest.
10. horizontal plate of palatine bone.
11. posterior nasal spine.
12. maxillary tuberosity (the most posterior end of the alveolar arch).
13. alveolar arch (carries the teeth).

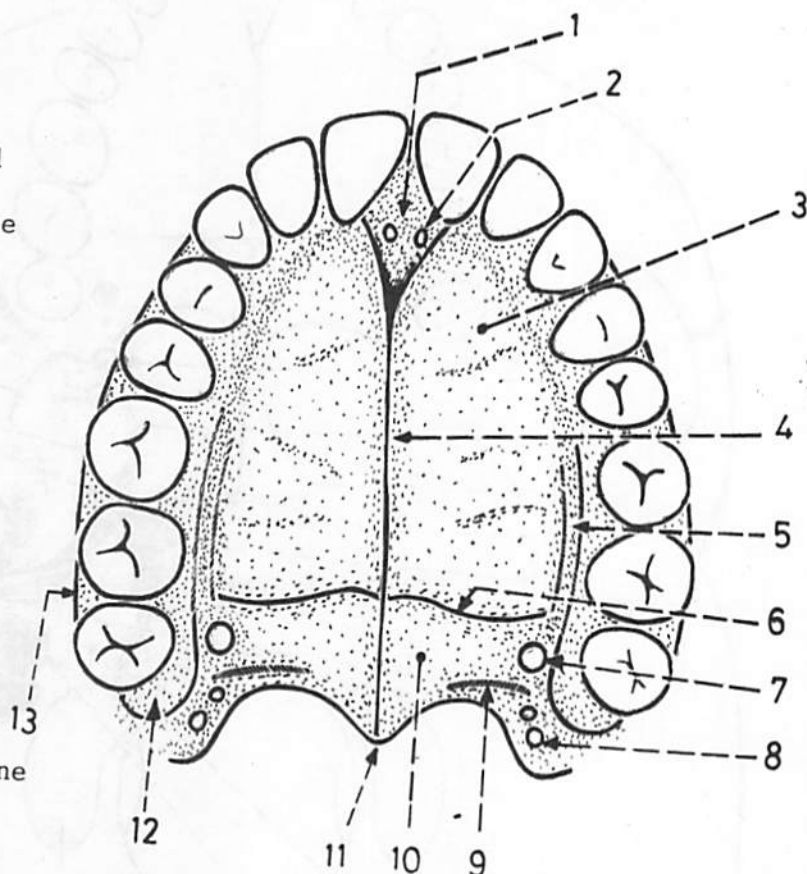
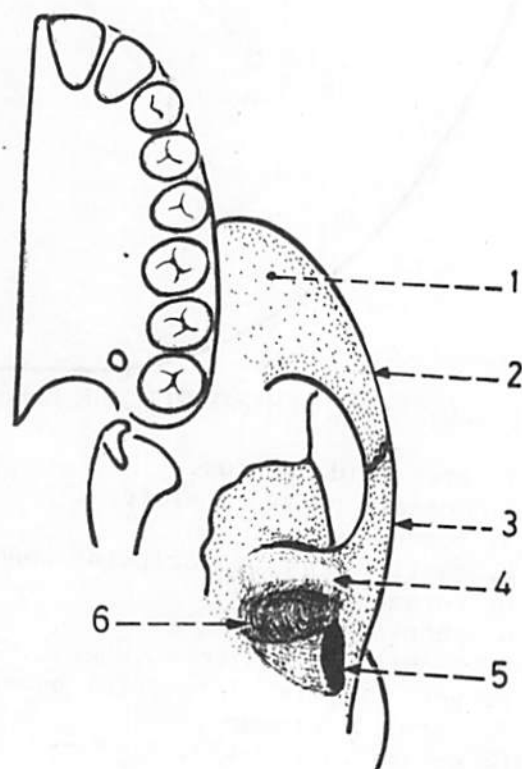


Fig.(32): ZYGOMATIC ARCH SEEN  
FROM BELOW

1. zygomatic bone.
2. temporal process of zygomatic bone.
3. zygomatic process of temporal bone (zygoma).
4. articular tubercle (eminence).
5. external acoustic meatus.
6. mandibular fossa (for the head of the mandible).

\* Note that the posterior end of the zygomatic arch is continuous with the supramastoid crest.



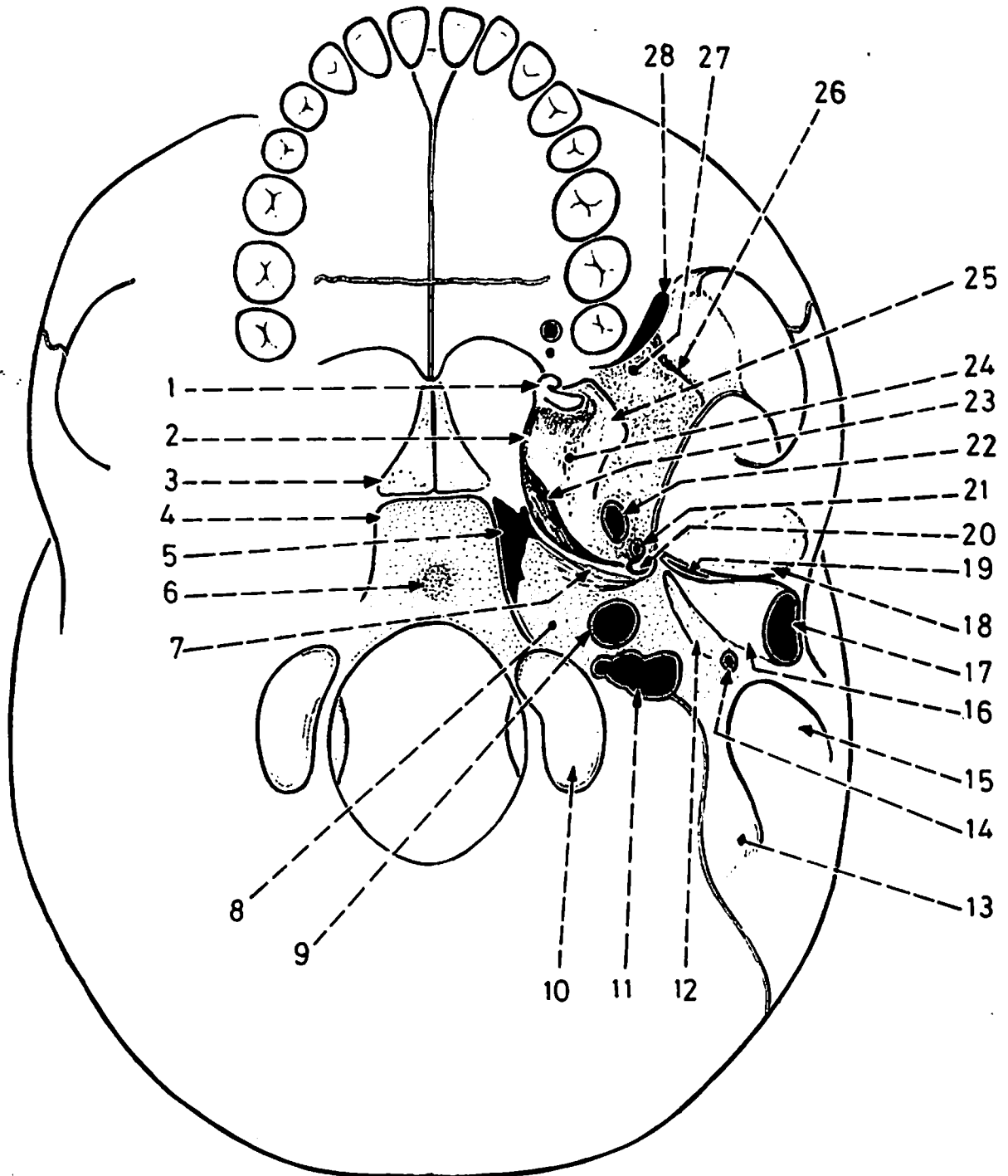


Fig.(33): MIDDLE PART OF THE BASE OF THE SKULL

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| 1. pterygoid hamulus.              | 15. mastoid process.                |
| 2. medial pterygoid plate.         | 16. tympanic part of temporal bone. |
| 3. vomer.                          | 17. external acoustic meatus.       |
| 4. basilar part of occipital bone. | 18. mandibular fossa.               |
| 5. foramen lacerum.                | 19. squamotympanic fissure.         |
| 6. pharyngeal tubercle.            | 20. spine of sphenoid.              |
| 7. groove for auditory tube.       | 21. foramen spinosum.               |
| 8. petrous part of temporal bone.  | 22. foramen ovale.                  |
| 9. carotid foramen.                | 23. scaphoid fossa.                 |
| 10. occipital condyle.             | 24. pterygoid fossa.                |
| 11. jugular foramen.               | 25. lateral pterygoid plate.        |
| 12. styloid process.               | 26. infratemporal crest.            |
| 13. mastoid notch.                 | 27. greater wing of sphenoid.       |
| 14. stylomastoid foramen.          | 28. inferior orbital fissure.       |

Fig.(34): PTERTYGOID PROCESS  
AND VOMER

The pterygoid process is a part of the sphenoid bone which lies just behind the maxilla. It consists of lateral and medial plates separated from each other by the pterygoid fossa. The vomer is a median bone which forms the posterior part of the nasal septum.

1. pterygoid hamulus.
2. vomer.
3. ala of the vomer.
4. basilar part of occipital bone.
5. vaginal process of the medial pterygoid plate.
6. medial pterygoid plate.
7. tubercle marking the opening of the pterygoid canal.
8. scaphoid fossa.
9. spine of sphenoid.
10. foramen spinosum.
11. foramen ovale.
12. pterygoid fossa.
13. lateral pterygoid plate.
14. pyramidal process of palatine bone.
15. maxillary tuberosity.
16. lesser palatine foramina.
17. greater palatine foramina.

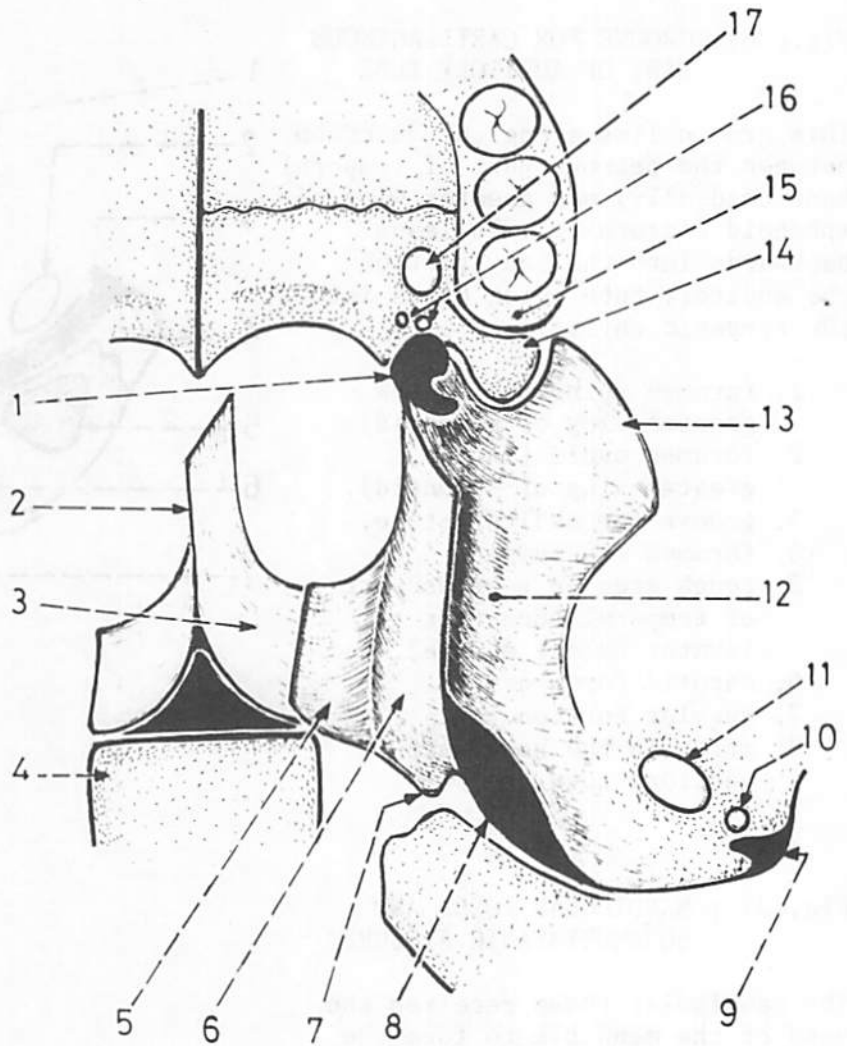


Fig.(35): PTERTYGOID, PALATOVAGINAL AND  
VOMEROVAGINAL CANALS

1. ala of vomer.
  2. sphenoidal process of palatine bone.
  3. pterygoid hamulus.
  4. lateral pterygoid plate.
  5. medial pterygoid plate.
  6. pterygoid fossa.
  7. scaphoid fossa.
  8. vaginal process of the medial pterygoid plate.
  9. body of sphenoid bone.
- (a) vomerovaginal canal.  
(b) palatovaginal canal.  
(c) pterygoid canal.

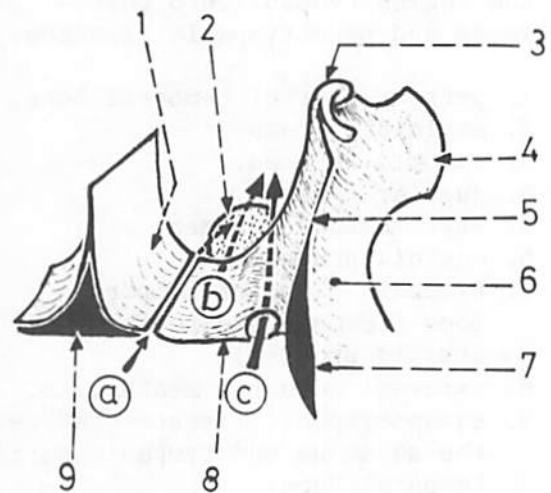


Fig.(36): GROOVE FOR CARTILAGENOUS PART OF AUDITORY TUBE

This groove lies along the junction between the petrous part of temporal bone (medially) and greater wing of sphenoid (laterally). It leads backwards into the bony part of the auditory tube which opens into the tympanic cavity.

1. foramen spinosum (in the greater wing of sphenoid).
2. foramen ovale (in the greater wing of sphenoid).
3. groove for auditory tube.
4. foramen lacerum.
5. rough area on petrous part of temporal bone (for levator palati muscle).
6. carotid foramen.
7. jugular foramen.
8. arrow in the bony part of auditory tube.

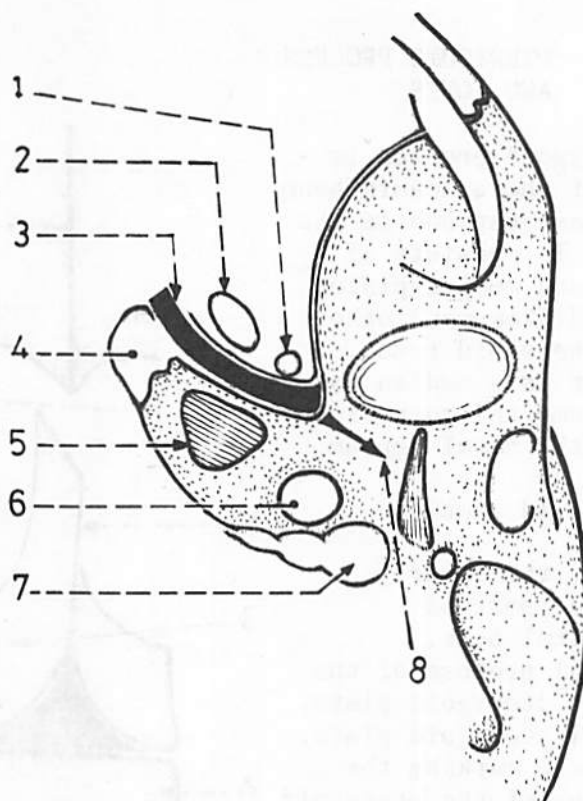


Fig.(37): MANDIBULAR FOSSA AND SQUAMOTYMPANIC FISSURE

The mandibular fossa receives the head of the mandible to form the temporomandibular joint.

The squamotympanic fissure is divided by the down-turned part of the tegmen tympani into petrosquamous and petrotympanic fissures.

1. petrous part of temporal bone.
2. styloid process.
3. carotid foramen.
4. jugular foramen.
5. stylomastoid foramen.
6. mastoid process.
7. tympanic plate of temporal bone (forms a sheath for the styloid process).
8. external acoustic meatus.
9. squamotympanic fissure (between the squamous and tympanic parts of temporal bone).
10. edge of tegmen tympani projecting into the squamotympanic fissure.
11. mandibular fossa.
12. articular tubercle (eminence).
13. zygomatic arch.

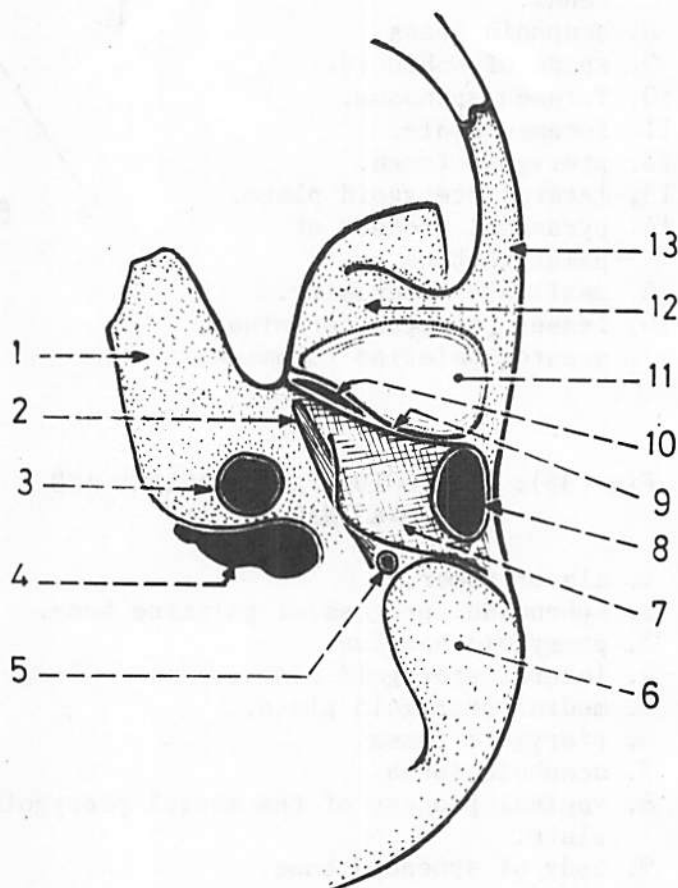


Fig.(38): INFERIOR SURFACE OF TEMPORAL BONE

1. arrow representing the chorda tympani as it leaves the squamotympanic fissure.
2. arrow in the groove for the auditory tube.
3. styloid process.
4. carotid canal (transmits the internal carotid artery).
5. inferior petrosal sinus (in the medial part of the jugular foramen).
6. accessory nerve.
7. vagus nerve.
8. glossopharyngeal nerve.
9. internal jugular vein (in the lateral part of the jugular foramen).
10. occipital artery (just medial to the mastoid notch).
11. mastoid notch (gives origin to the posterior belly of digastric).
12. facial nerve emerging from the stylomastoid foramen.
13. squamotympanic fissure.
14. mandibular fossa.

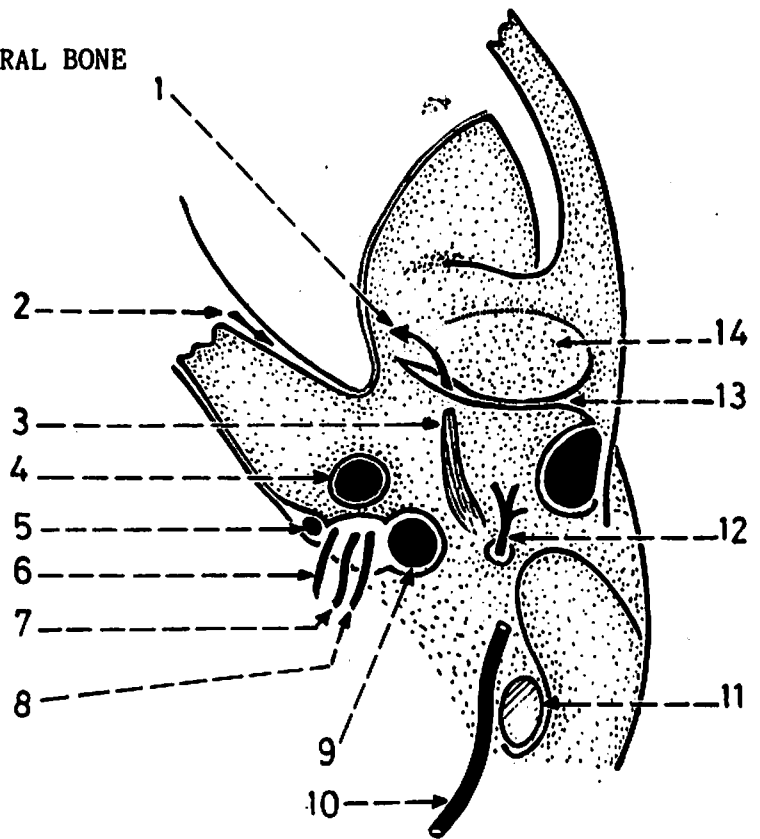
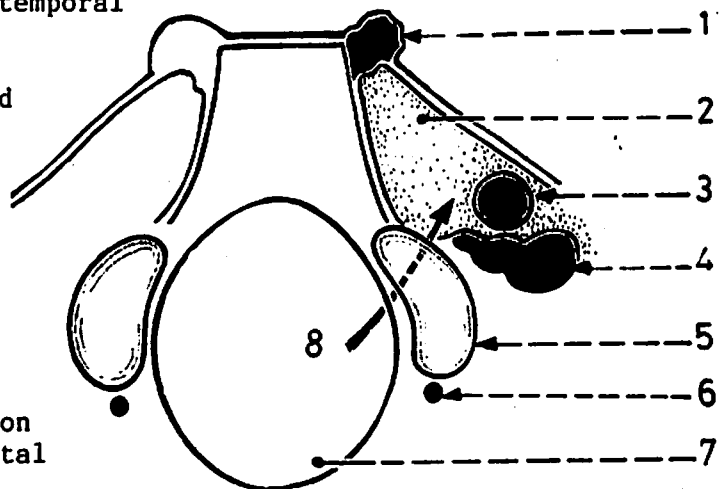


Fig.(39): FORAMINA RELATED TO THE PETROUS TEMPORAL BONE AND OCCIPITAL CONDYLE

The foramina related to the petrous temporal bone (as seen from the base) are the foramen lacerum, carotid canal and jugular foramen. The foramina related to the occipital condyle are the hypoglossal canal and posterior condylar foramen.

1. foramen lacerum (at the apex of petrous temporal bone).
2. petrous temporal bone.
3. carotid canal (in the petrous bone close to its base).
4. jugular foramen (at the junction between the petrous and occipital bones).
5. occipital condyle.
6. posterior condylar foramen (an emissary foramen).
7. foramen magnum.
8. hypoglossal (anterior condylar) canal.



\* The foramen lacerum has an irregular lacerated margin.

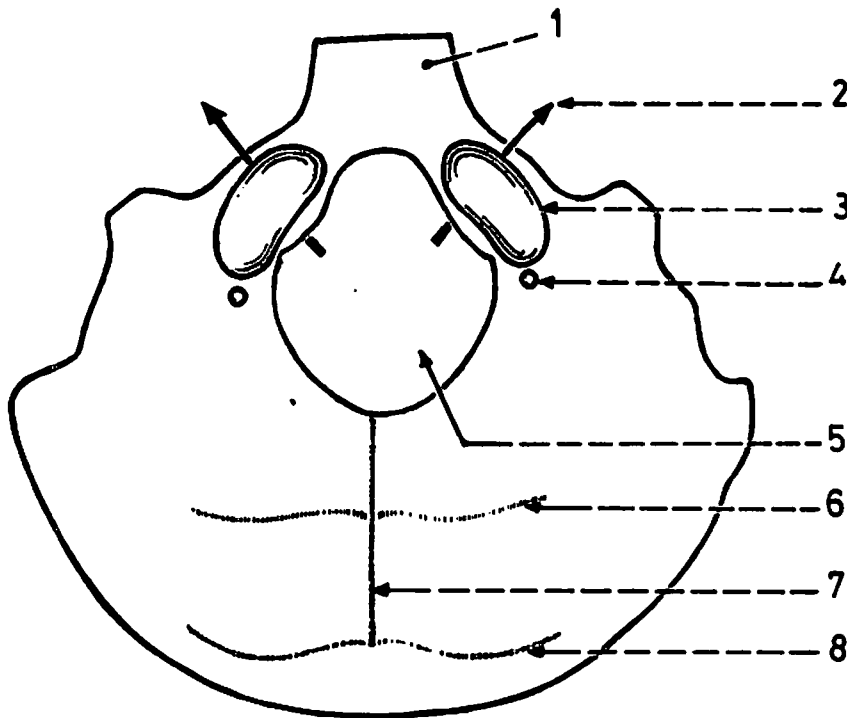


Fig.(40): OCCIPITAL BONE IN THE POSTERIOR PART OF NORMA BASALIS

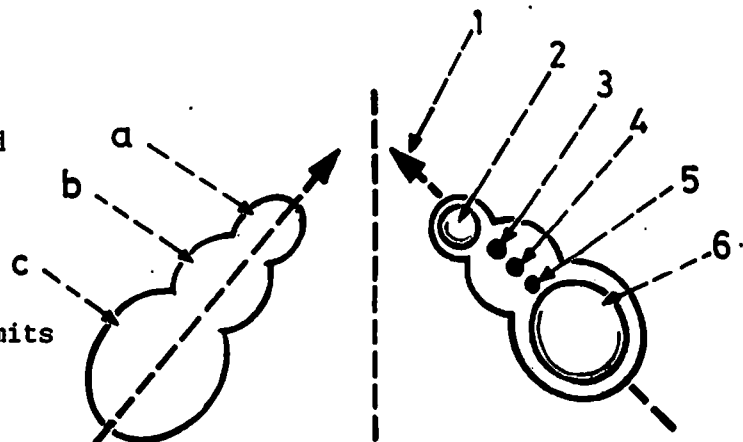
1. basilar part of occipital bone.
2. hypoglossal canal (in front of the occipital condyle).
3. occipital condyle.
4. posterior condylar foramen.
5. foramen magnum (the largest foramen).
6. inferior nuchal line.
7. external occipital crest.
8. superior nuchal line.

- \* The hypoglossal canal transmits the hypoglossal nerve.
- \* The posterior condylar foramen transmits an emissary vein (commonly absent).

Fig.(41): JUGULAR FORAMEN

Its long axis is directed forwards and medially, and is divided into 3 compartments: medial, intermediate and lateral.

- (a) medial compartment (narrowest).
- (b) intermediate compartment (transmits 9, 10, 11 cranial nerves).
- (c) lateral compartment (widest).



1. long axis of the foramen.
2. inferior petrosal sinus.
3. accessory nerve (11).
4. vagus nerve (10).
5. glossopharyngeal nerve (9).
6. internal jugular vein.

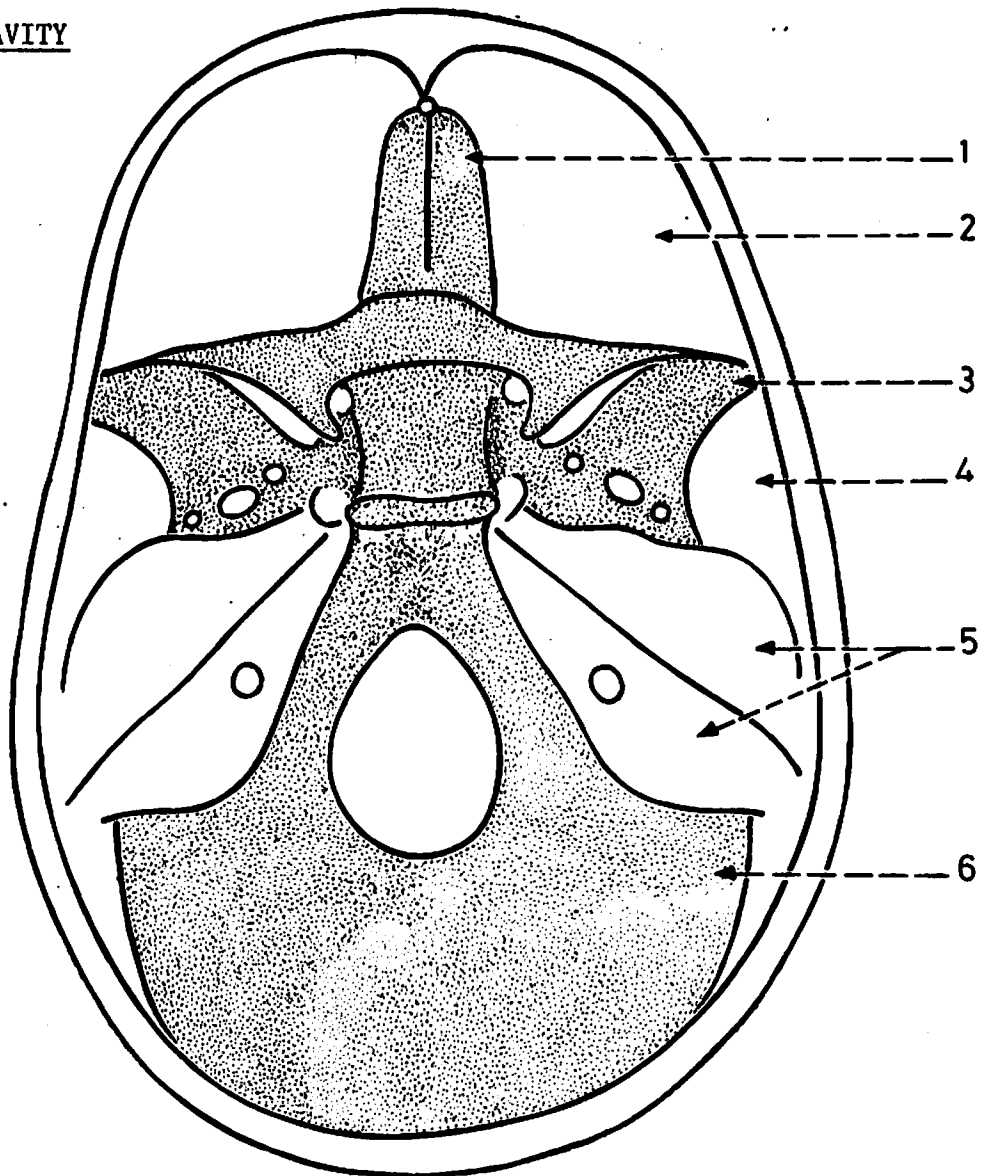
CRANIAL CAVITY

Fig.(42): BONES FORMING THE FLOOR OF THE CRANIAL CAVITY

1. cribriform plate of ethmoid bone.
2. orbital plate of frontal bone.
3. sphenoid bone (body, lesser wing and greater wing).
4. small part of squamous temporal bone.
5. petrous temporal bone.
6. occipital bone.

\* Note that the floor of the cranial cavity corresponds to the internal aspect of the base of the skull.

\* Note also that the ethmoid, sphenoid and occipital bones are single while the other bones are bilateral.

Fig.(43): THE 3 CRANIAL FOSSAE  
(top view)

The floor of the cranial cavity is divided into 3 fossae: anterior, middle and posterior.

1. anterior cranial fossa  
(forms the roof of the nose and the 2 orbits).
2. middle cranial fossa  
(its median part is narrow and corresponds to the body of sphenoid).
3. posterior cranial fossa  
(the largest and deepest).
4. foramen magnum.

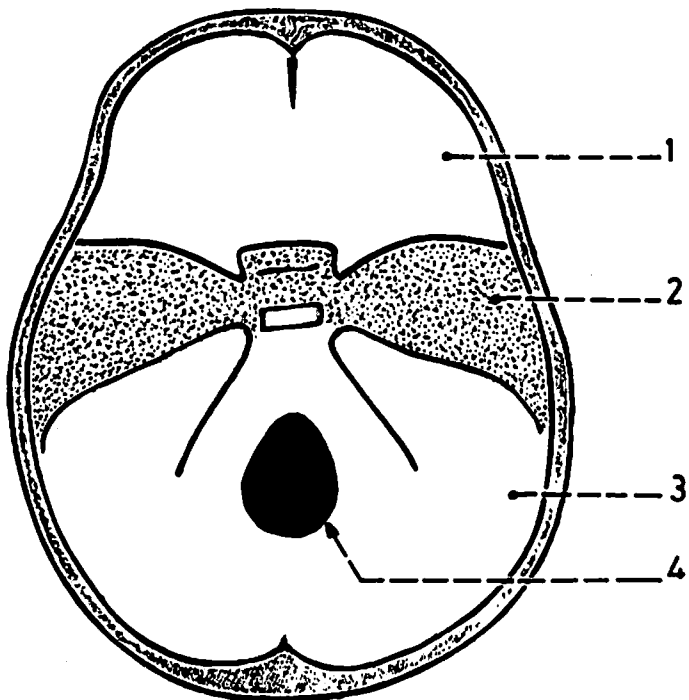
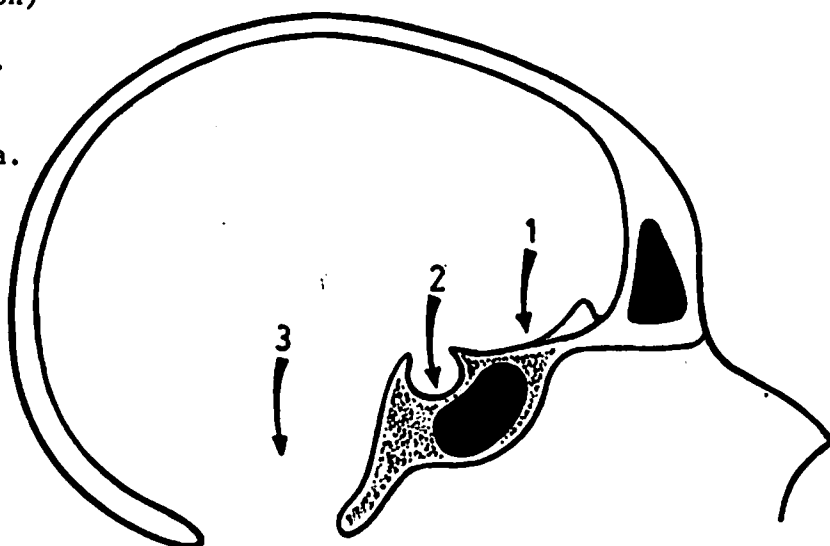


Fig.(44): THE 3 CRANIAL FOSSAE  
(in sagittal section)

1. anterior cranial fossa.
2. middle cranial fossa  
(middle part).
3. posterior cranial fossa.

\* Note that the median part of the middle cranial fossa is very small.





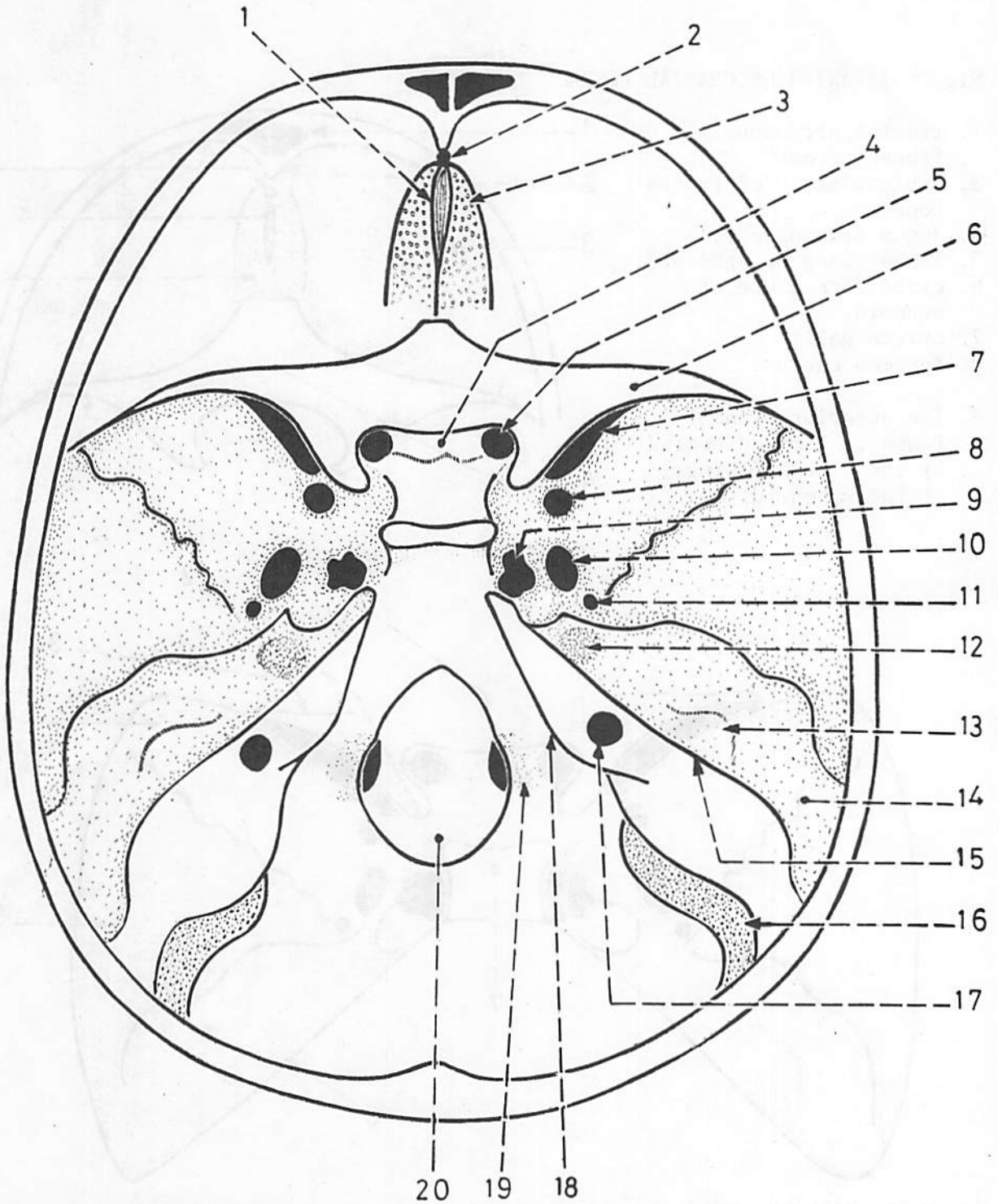


Fig.(45): FLOOR OF CRANIAL CAVITY

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. crista galli.                     | 11. foramen spinosum.              |
| 2. foramen caecum.                   | 12. fossa for trigeminal ganglion. |
| 3. cribriform plate of ethmoid.      | 13. arcuate eminence.              |
| 4. optic groove (sulcus chiasmatis). | 14. tegmen tympani.                |
| 5. optic canal.                      | 15. superior petrosal groove.      |
| 6. lesser wing of sphenoid.          | 16. sigmoid sulcus.                |
| 7. superior orbital fissure.         | 17. internal acoustic meatus.      |
| 8. foramen rotundum.                 | 18. inferior petrosal groove.      |
| 9. foramen lacerum.                  | 19. jugular eminence.              |
| 10. foramen ovale.                   | 20. foramen magnum.                |

Fig.(46): ANTERIOR CRANIAL FOSSA

1. frontal air sinus.
2. frontal crest.
3. orbital plate of frontal bone.
4. jugum sphenoidale.
5. lesser wing of sphenoid.
6. cribriform plate of ethmoid.
7. crista galli.
8. foramen caecum.

\* The anterior cranial fossa is limited behind by the 2 lesser wings of the sphenoid.

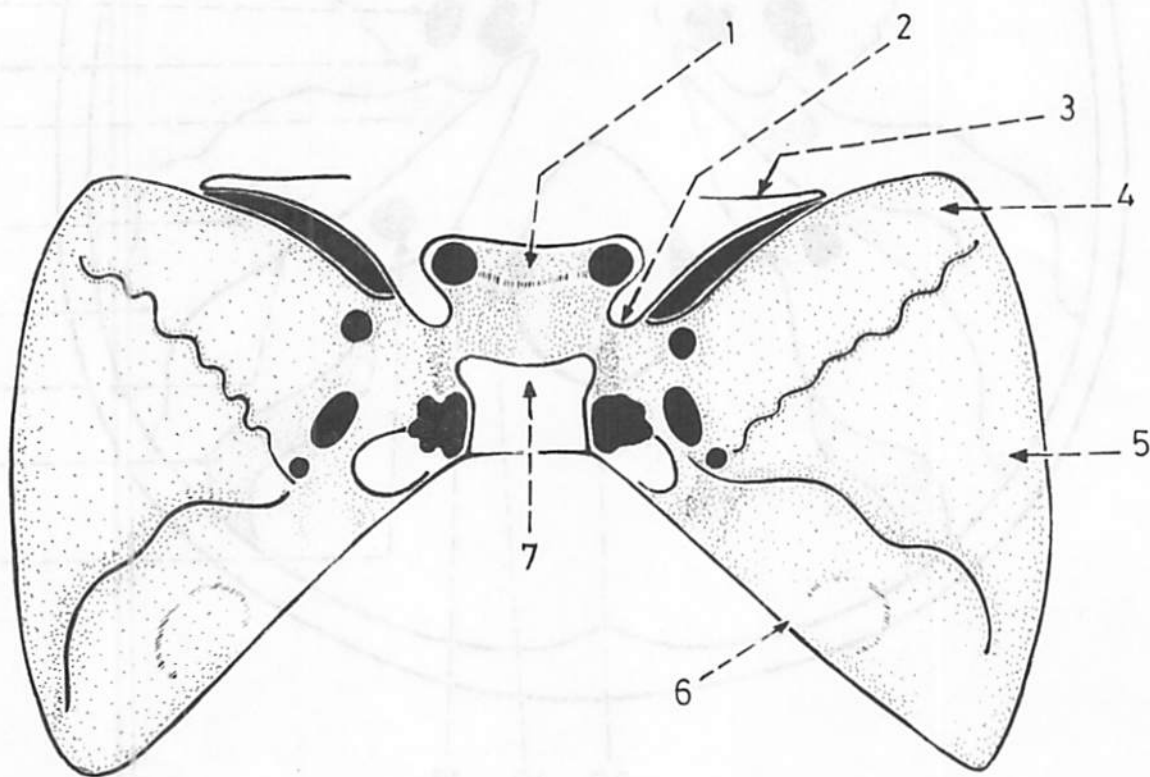
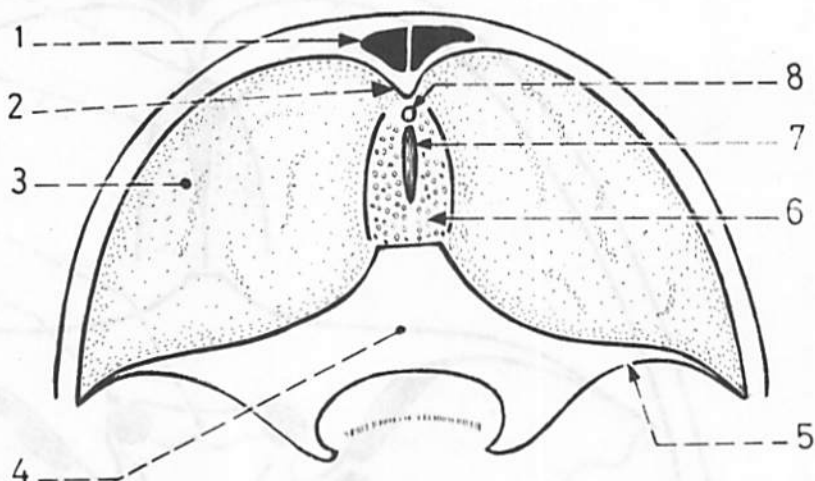


Fig.(47): BOUNDARIES OF MIDDLE CRANIAL FOSSA

It is bounded in front by the 2 lesser wings of sphenoid and anterior margin of the optic groove. It is bounded behind by the superior borders of the 2 petrous temporal bones and the dorsum sellae.

1. optic groove (sulcus chiasmatis).
2. anterior clinoid process.
3. lesser wing of sphenoid.
4. greater wing of sphenoid.
5. squamous part of temporal bone.
6. superior border of petrous temporal bone.
7. dorsum sellae.

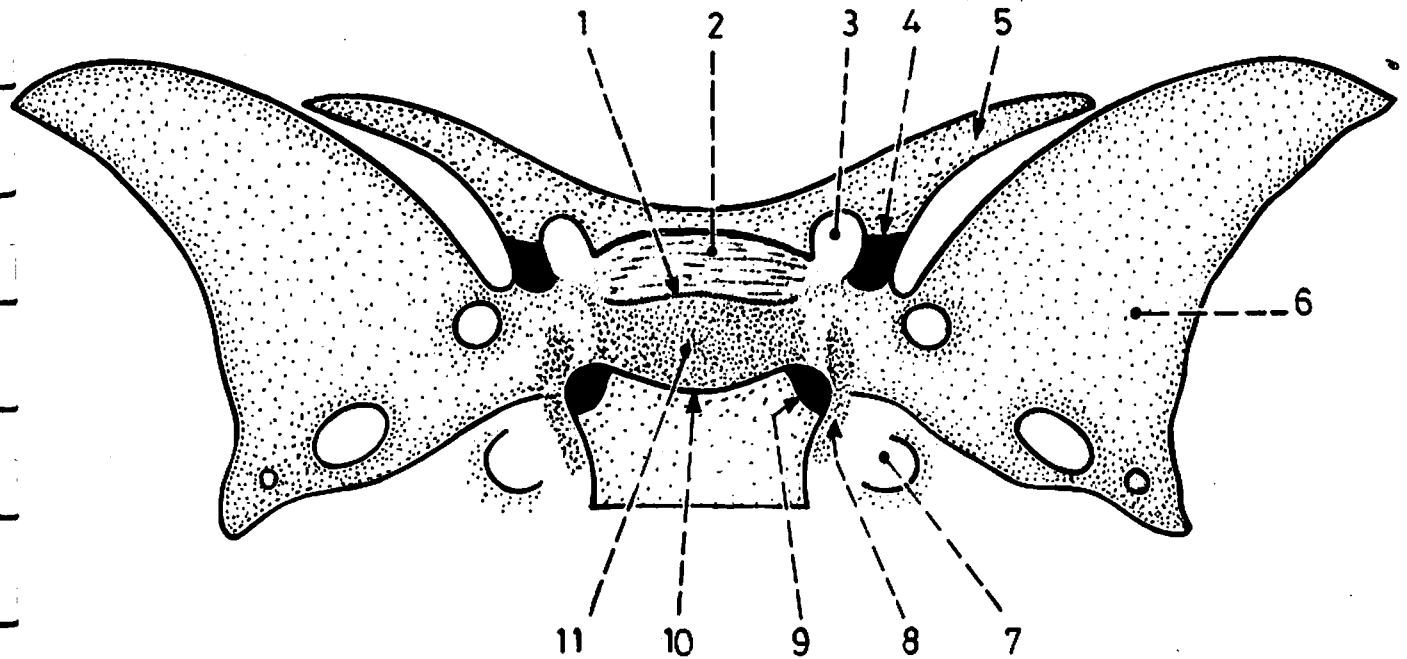


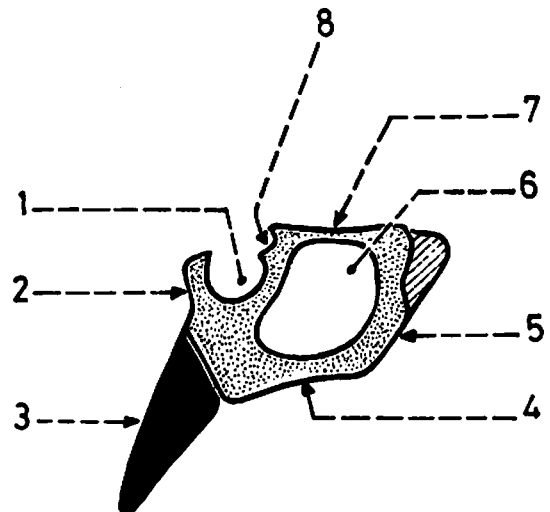
Fig.(48): MEDIAN PART OF THE MIDDLE CRANIAL FOSSA

It is elevated and is formed by the body of sphenoid. It is bounded in front by the anterior margin of the optic groove and behind by the dorsum sellae. The upper surface of the body of sphenoid is concave and is called the sella turcica. The side of the body of sphenoid shows a deep groove for the internal carotid artery.

1. tuberculum sellae (posterior margin of the optic groove).
2. optic groove (forms the anterior part of the sella turcica).
3. optic canal (leads to the orbit).
4. anterior clinoid process (free end of the lesser wing of sphenoid).
5. lesser wing of sphenoid.
6. greater wing of sphenoid (forms the lateral part of the fossa).
7. foramen lacerum.
8. groove for the internal carotid artery (on the side of the body of sphenoid).
9. posterior clinoid process (lateral edge of the dorsum sellae).
10. dorsum sellae (posterior wall of the sella turcica).
11. hypophyseal fossa for the pituitary gland (forms the posterior part of the sella turcica).

Fig.(49): BODY OF SPHENOID  
(sagittal section)

1. hypophyseal fossa.
2. dorsum sellae.
3. basilar part of occipital bone (forms the clivus).
4. inferior surface of body of sphenoid.
5. anterior surface of body of sphenoid (roof of the nose).
6. sphenoidal air sinus.
7. jugum sphenoidale.
8. optic groove.



\* The inferior surface of the body of sphenoid is in contact with the vomer.

Fig.(50): LATERAL PART OF MIDDLE CRANIAL FOSSA

It is deeper than the median part.

1. superior orbital fissure.
2. foramen rotundum.
3. foramen ovale.
4. foramen spinosum.
5. hiatus for lesser petrosal nerve.
6. tegmen tympani.
7. arcuate eminence (formed by the superior semicircular canal).
8. hiatus for greater petrosal nerve.
9. fossa for trigeminal ganglion.
10. carotid canal transmitting the internal carotid artery.
11. foramen lacerum.

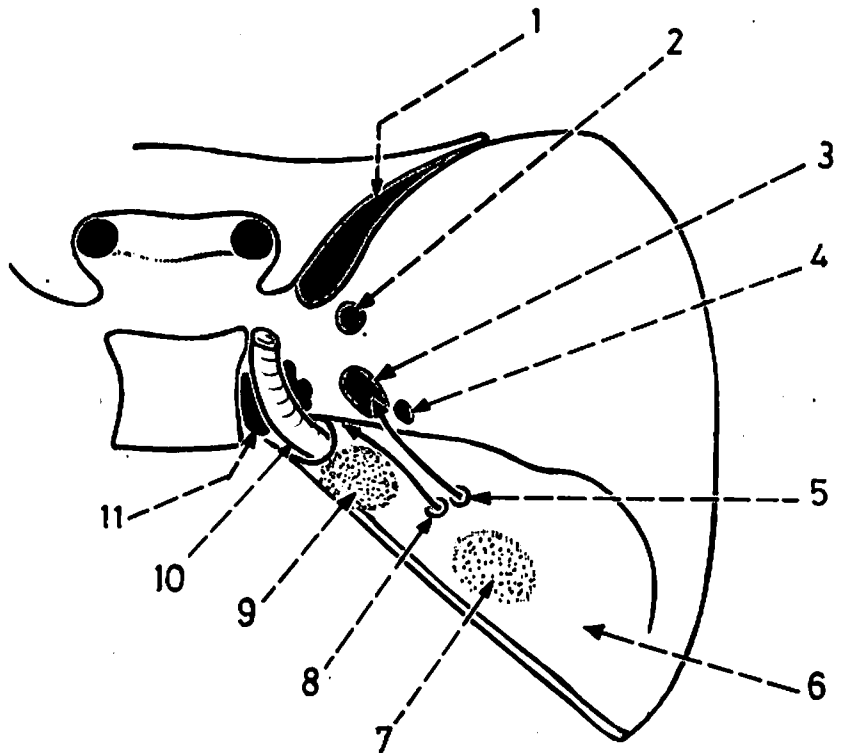


Fig.(51): TEGMEN TYMPANI AND CAROTID CANAL  
(section in the petrous temporal bone)

1. middle ear.
2. tegmen tympani (forms the roof of the middle ear and mastoid antrum).
3. mastoid antrum (posterior extension of the middle ear).
4. mastoid process.
5. part of the jugular foramen.
6. carotid canal traversing the petrous temporal bone.
7. apex of the petrous temporal bone.

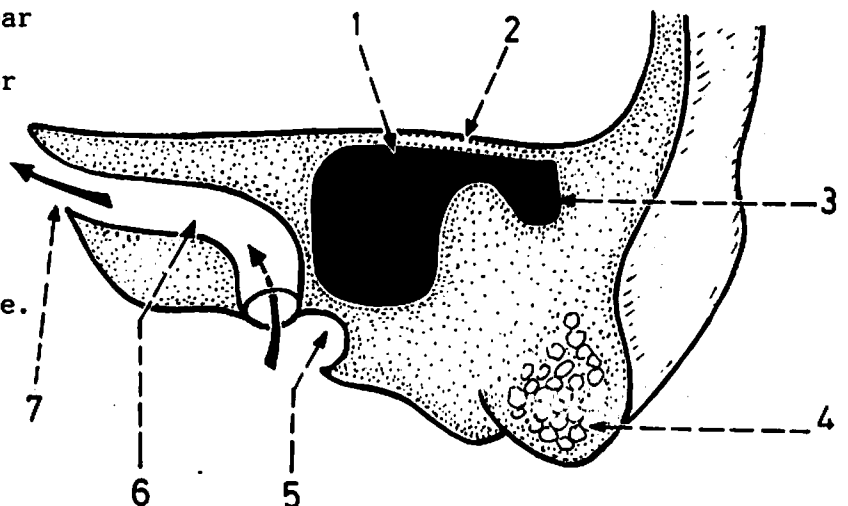


Fig.(52): POSTERIOR CRANIAL FOSSA

1. clivus (formed by the basilar part of occipital bone and dorsum sellae).
2. internal acoustic meatus.
3. petrous temporal bone.
4. sigmoid sulcus leading to the jugular foramen.
5. jugular eminence.
6. internal occipital crest.
7. internal occipital protuberance.
8. foramen magnum.

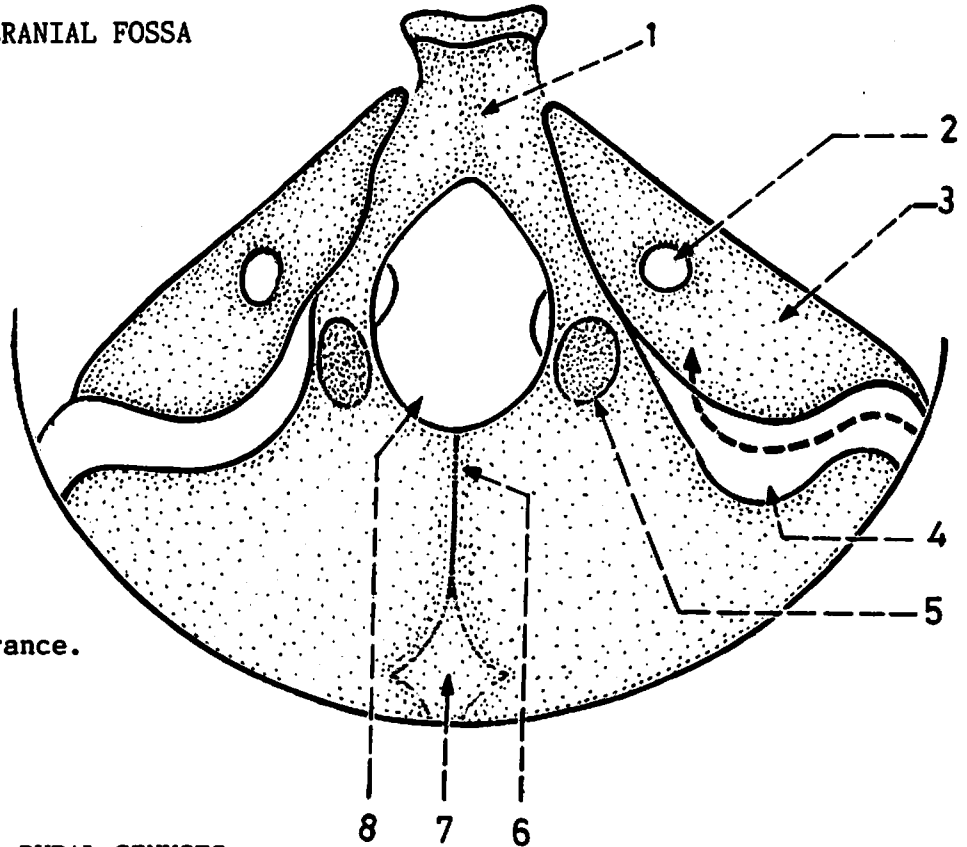
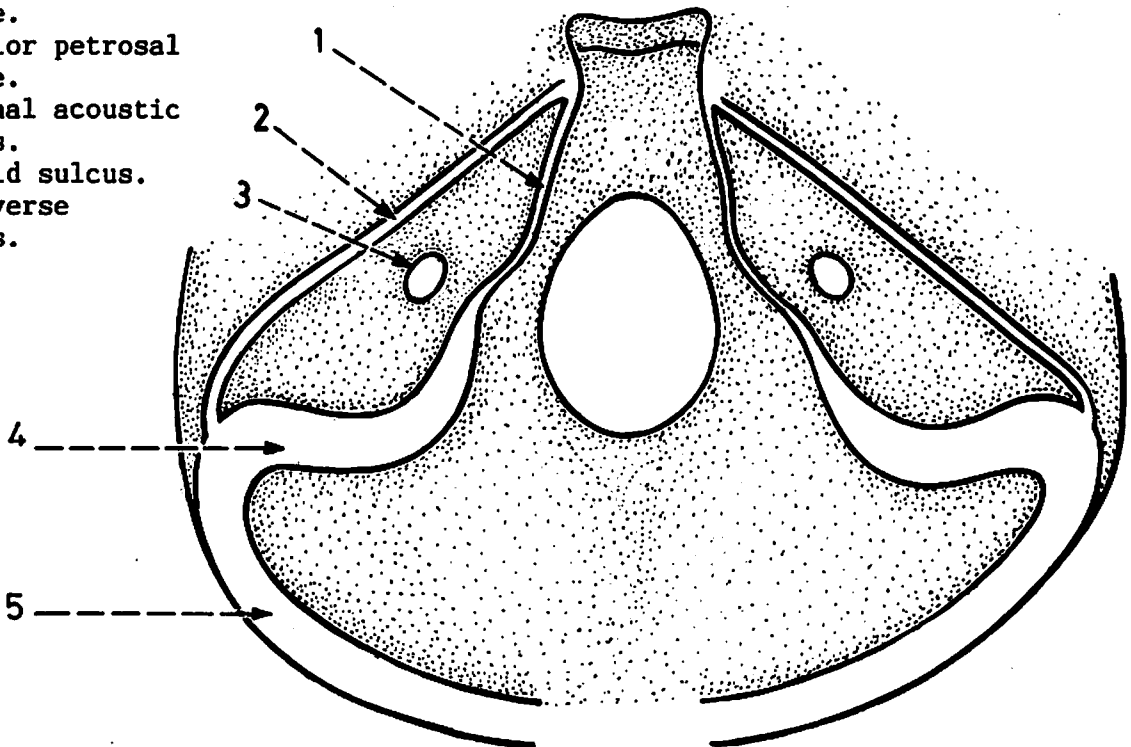


Fig.(53): GROOVES FOR DURAL SINUSES IN THE POSTERIOR CRANIAL FOSSA

1. inferior petrosal groove.
2. superior petrosal groove.
3. internal acoustic meatus.
4. sigmoid sulcus.
5. transverse sulcus.



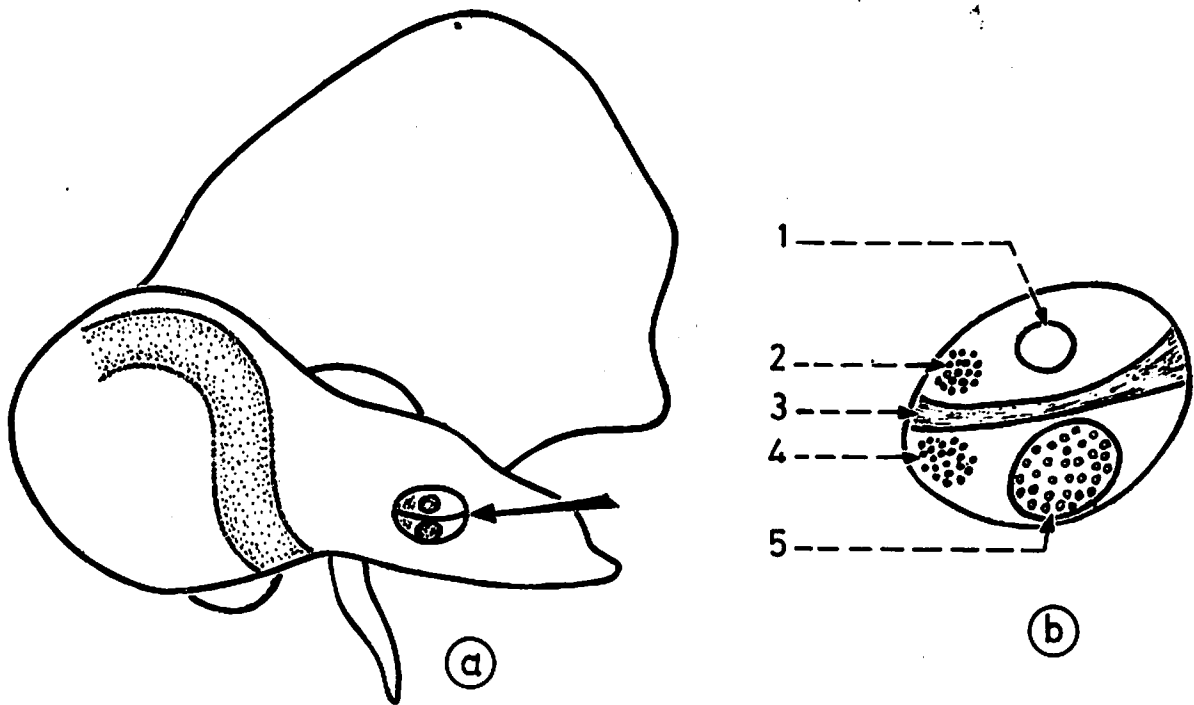


Fig.(54): BOTTOM OF THE INTERNAL ACOUSTIC MEATUS

The internal acoustic meatus lies on the posterior aspect of the petrous temporal bone (a). Its bottom (b) is divided by a transverse crest into upper and lower parts: the upper part shows the foramen for the facial nerve while the lower part shows the foramina for the cochlear division of the 8th nerve. The vestibular division passes through the posterior part of the bottom.

1. foramen for the facial nerve.
2. superior vestibular area (for vestibular nerve fibres).
3. transverse crest.
4. inferior vestibular area (for vestibular nerve fibres).
5. cochlear area (for cochlear nerve fibres).

Fig.(55): STRUCTURES PASSING THROUGH THE INTERNAL ACOUSTIC MEATUS

These are the facial and vestibulocochlear nerves as well as the labyrinthine artery.

1. facial nerve after leaving the petrous temporal bone.
2. styloid process.
3. vestibulocochlear nerve.
4. facial nerve entering the internal acoustic meatus.
5. labyrinthine artery.
6. internal acoustic meatus.

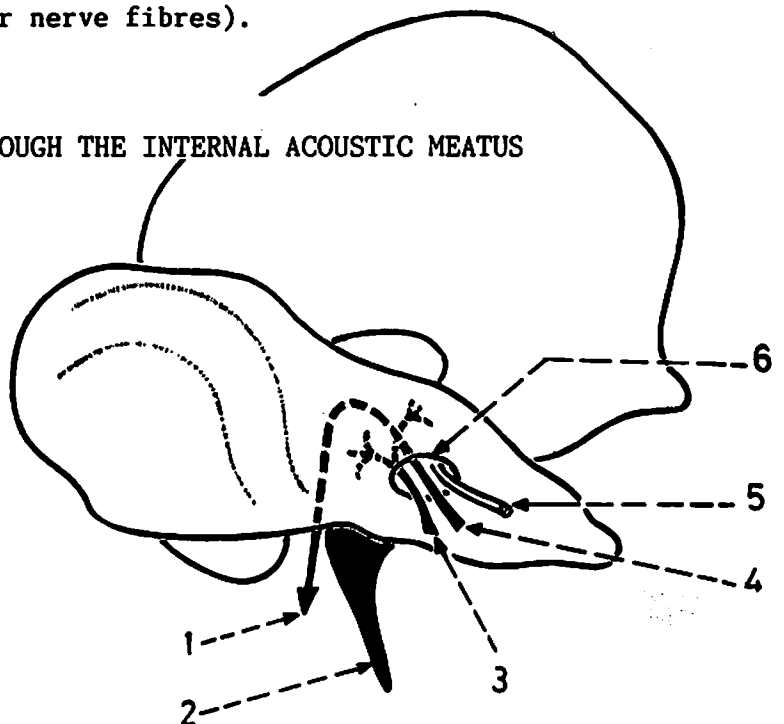


Fig.(56): INTERNAL SURFACE OF SKULL CAP

It shows the frontal crest, sagittal sulcus, grooves for the middle meningeal vessels and pits for arachnoid granulations.

1. frontal crest.
2. coronal suture.
3. grooves for middle meningeal vessels.
4. groove for superior sagittal sinus.
5. pits for arachnoid granulations.
6. wall of the skull showing outer and inner tables and diploe in between.

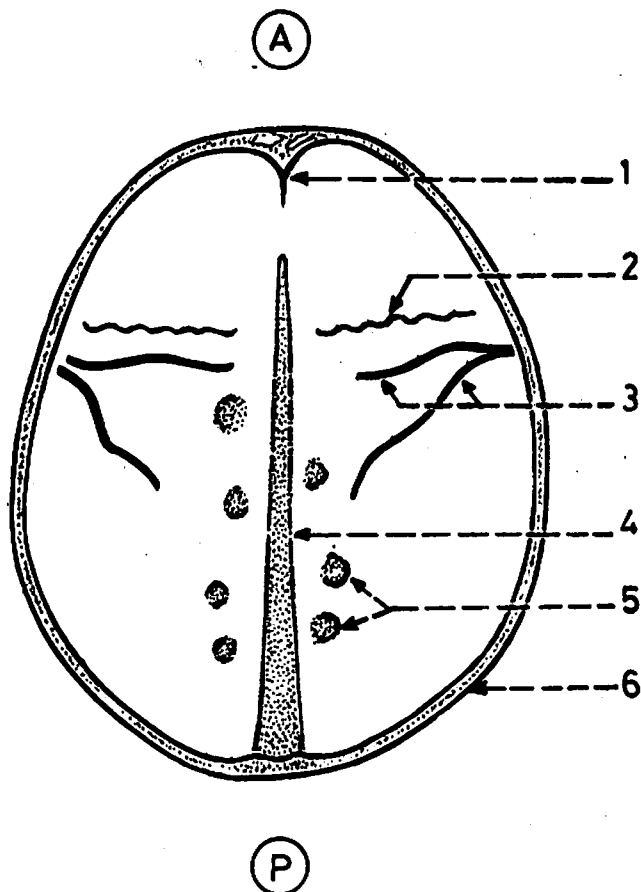
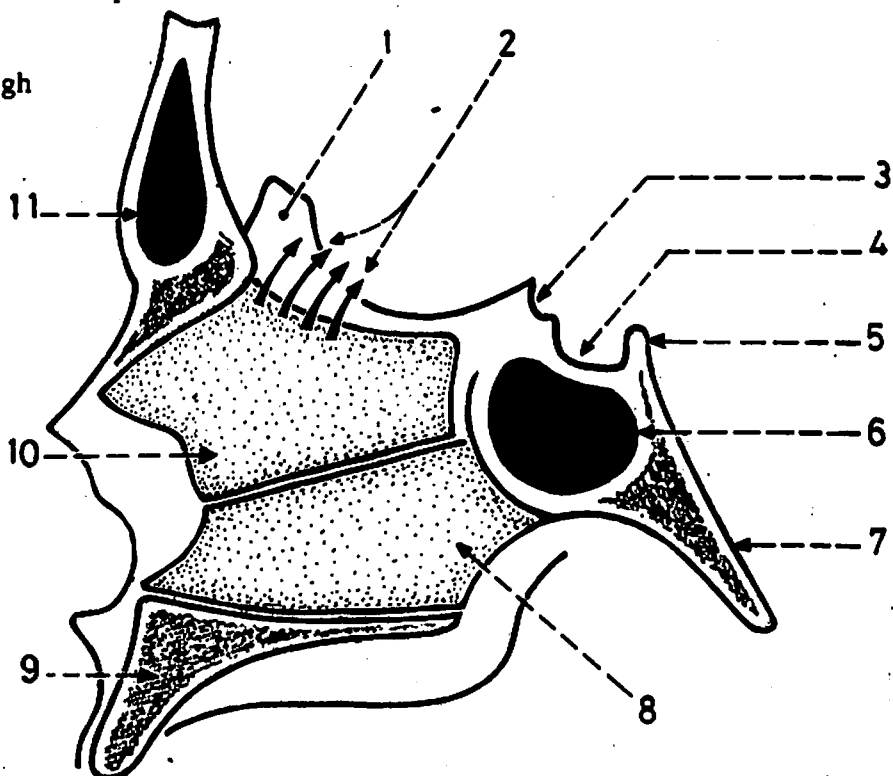


Fig.(57): SAGITTAL SECTION IN THE ANTERIOR PART OF THE SKULL

A sagittal section in the skull passes through the nasal septum as well as the sphenoidal air sinus.

1. crista galli.
2. arrows passing through the cribriform plate of ethmoid bone.
3. optic groove (anterior part of sella turcica).
4. hypophyseal fossa.
5. dorsum sellae.
6. sphenoidal air sinus.
7. clivus.
8. vomer (part of nasal septum).
9. hard palate.
10. perpendicular plate of ethmoid (part of nasal septum).
11. frontal air sinus.



# MANDIBLE

Fig.(58): MANDIBLE FROM IN FRONT

The mandible consists of a curved body and 2 rami which project upwards one on each side.

1. symphysis menti (line of fusion of the 2 halves of the foetal mandible).
2. mental tubercle (at the right end of the mental protuberance).
3. mental protuberance (triangular elevation).
4. mental tubercle (at the left end of the mental protuberance).
5. body of the mandible.
6. ramus of the mandible.

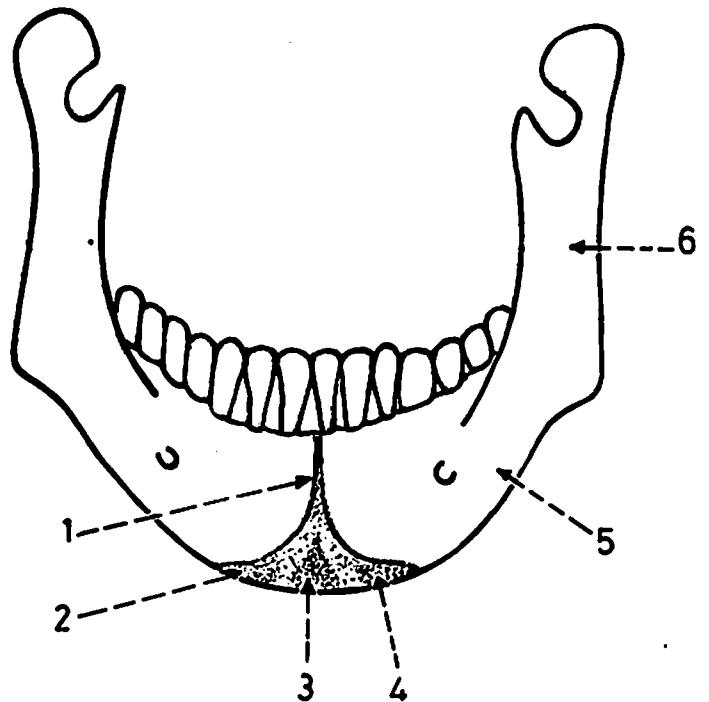
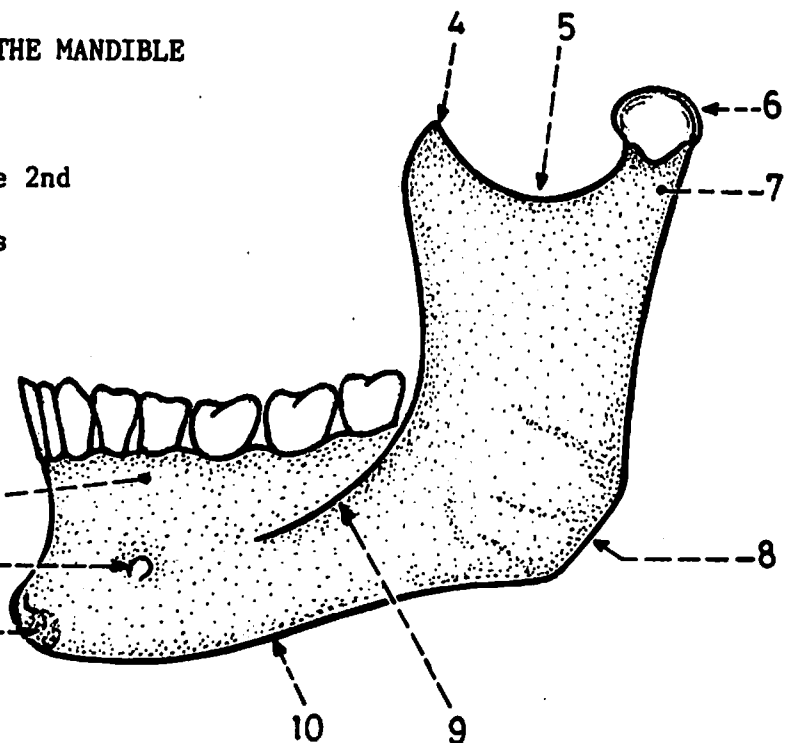


Fig.(59): EXTERNAL SURFACE OF THE MANDIBLE (side view)

1. mental tubercle.
2. mental foramen (below the 2nd premolar tooth).
3. alveolar process (carries the teeth).
4. coronoid process.
5. mandibular notch.
6. head of the mandible.
7. neck of the mandible.
8. angle of the mandible.
9. oblique line (continuous with the anterior border of the ramus).
10. base of the mandible (lower border of the body).



\* Note that the head of the mandible forms the condylar process.



Fig.(60): INTERNAL SURFACE OF THE MANDIBLE

1. fossa for sublingual gland.
2. mental spine (consists of 2 superior and 2 inferior genial tubercles).
3. digastric fossa.
4. mylohyoid line.
5. fossa for submandibular gland.
6. rough area for medial pterygoid muscle.
7. mylohyoid groove.
8. mandibular foramen (leads to the mandibular canal).
9. lingula (a small process of bone).
10. depression (fovea) for the lateral pterygoid muscle.

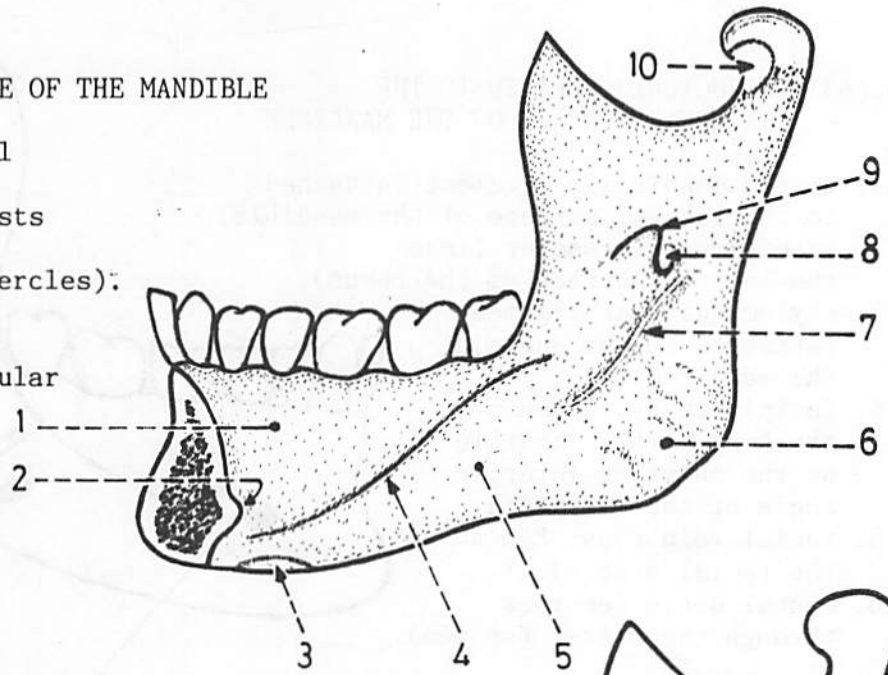


Fig.(61): MYLOHYOID LINE AND MANDIBULAR CANAL

1. mylohyoid line: runs downwards and forwards on the internal surface of the body of the mandible from just behind the 3rd molar tooth to the inferior genial tubercle.
2. mandibular canal: runs in the body of the mandible just below the sockets of the teeth from the mandibular foramen behind to the mental foramen in front.

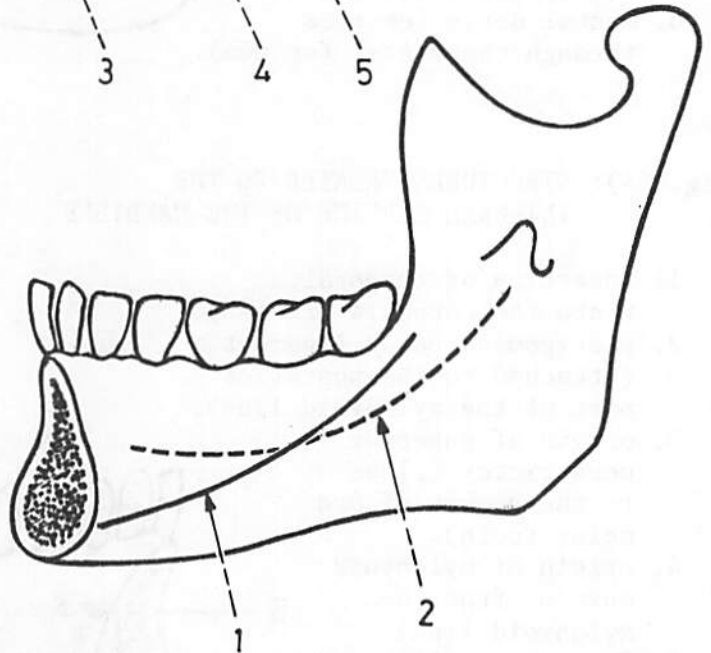


Fig.(62): MUSCLES ATTACHED TO THE EXTERNAL SURFACE OF THE MANDIBLE

1. insertion of platysma. (to the lower border of the body).
2. origin of buccinator (from the oblique line).
3. insertion of masseter (into the ramus).

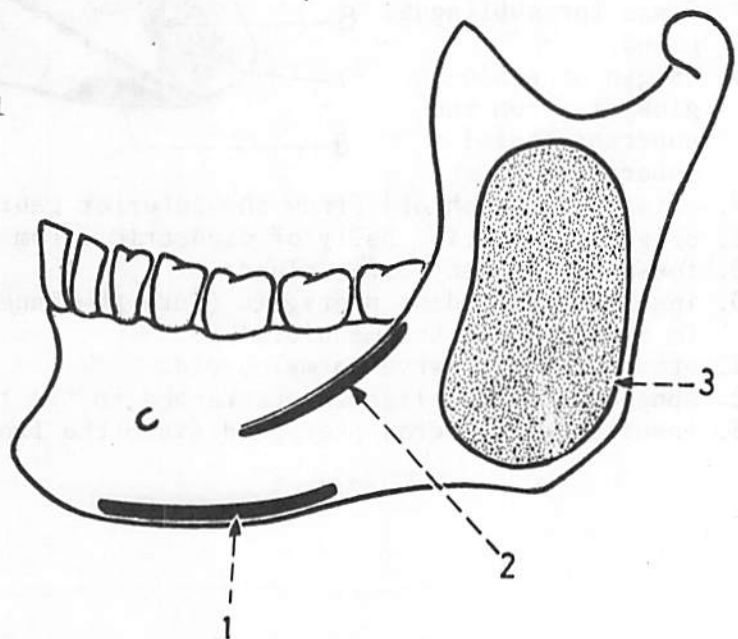


Fig.(63): STRUCTURES RELATED TO THE EXTERNAL SURFACE OF THE MANDIBLE

1. temporomandibular ligament (attached to the lateral surface of the mandible).
2. insertion of masseter (into the lateral surface of the ramus).
3. stylomandibular ligament (attached to the angle of the mandible).
4. facial artery (crosses the body of the mandible at the anterior-inferior angle of the masseter).
5. facial vein (just behind the facial artery).
6. mental nerve (emerges through the mental foramen).

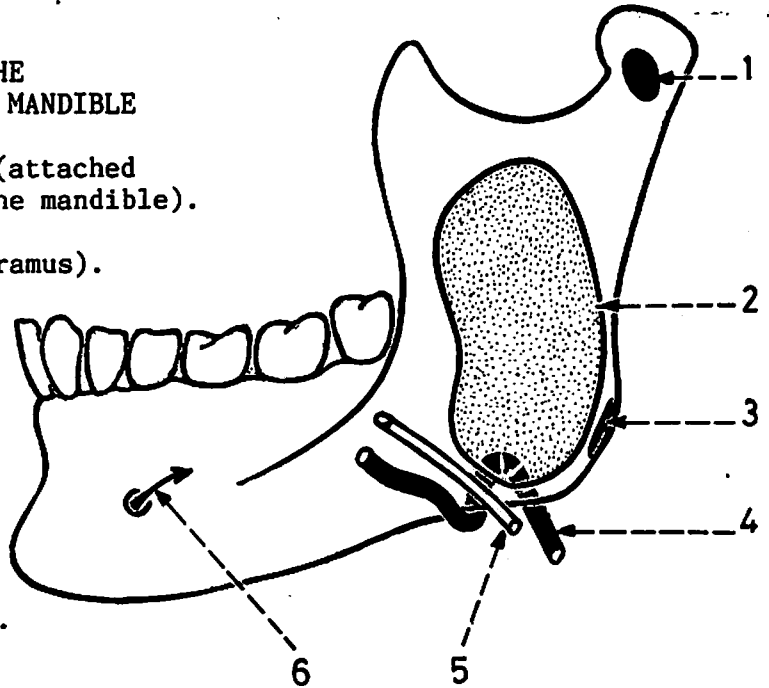


Fig.(64): STRUCTURES RELATED TO THE INTERNAL SURFACE OF THE MANDIBLE

1. insertion of temporalis (into the coronoid process).
2. pterygomandibular ligament (attached to the posterior part of the mylohyoid line).
3. origin of superior constrictor (close to the socket of 3rd molar tooth).
4. origin of mylohyoid muscle (from the mylohyoid line).
5. fossa for sublingual gland.
6. origin of genio-glossus (from the superior genial tubercle).
7. origin of geniohyoid (from the inferior genial tubercle).
8. origin of anterior belly of digastric (from digastric fossa).
9. fossa for submandibular gland.
10. insertion of medial pterygoid (into the inner surface of the ramus close to the angle of the mandible).
11. groove for the nerve to mylohyoid.
12. sphenomandibular ligament (attached to the lingula).
13. insertion of lateral pterygoid (into the front of the neck of the mandible).

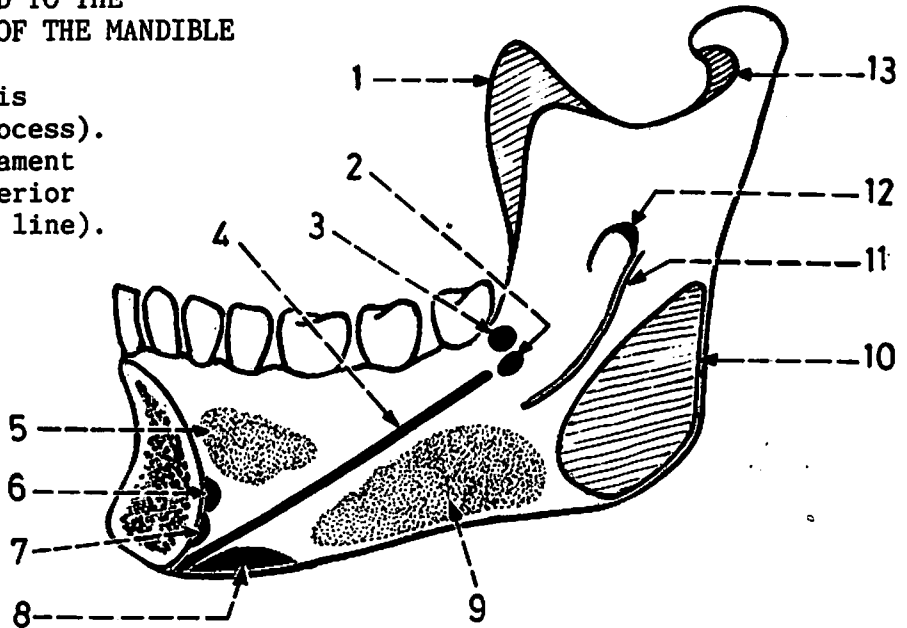


Fig.(65): NERVES AND VESSELS RELATED TO THE INTERNAL SURFACE OF THE MANDIBLE

1. lingual nerve (just behind the socket of the 3rd molar tooth).
2. inferior alveolar nerve (in the mandibular canal).
3. auriculotemporal nerve (medial to the neck of the mandible).
4. maxillary artery (medial to the neck of the mandible).
5. inferior alveolar artery (in the mandibular canal).
6. mylohyoid nerve (in the mylohyoid groove).
7. submandibular lymph node.
8. facial artery.
9. submandibular salivary gland (below the mylohyoid line).
10. mylohyoid line.

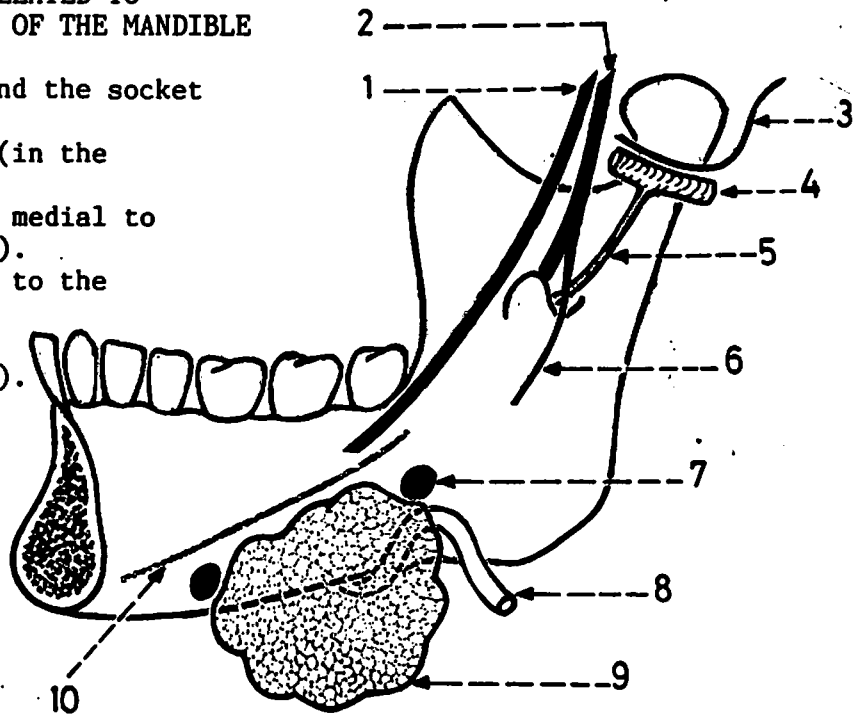
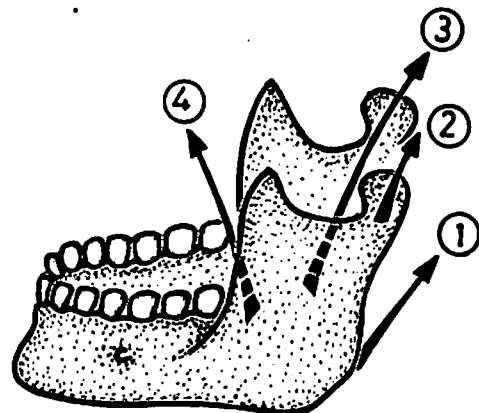


Fig.(66): LIGAMENTS ATTACHED TO THE MANDIBLE

1. stylomandibular ligament (to the angle of the mandible).
2. temporomandibular ligament (to the lateral surface of the neck of the mandible).
3. sphenomandibular ligament (to the lingula of the mandible).
4. pterygomandibular ligament (to the posterior end of the mylohyoid line).

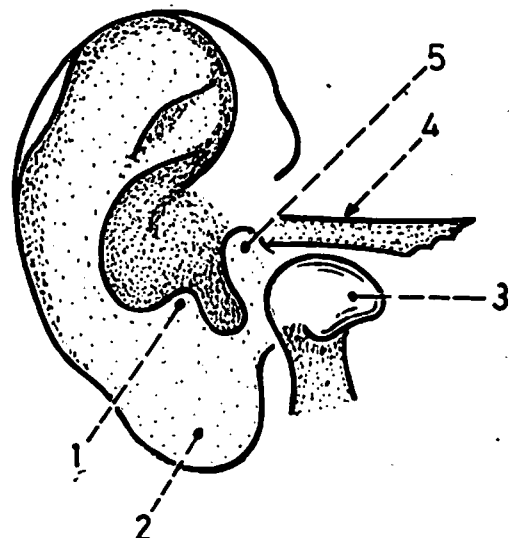


\* Note that the strongest ligament is the temporomandibular ligament.

Fig.(67): POSITION OF THE HEAD OF THE MANDIBLE

The head of the mandible lies just below the posterior part of the zygomatic arch, in front of the tragus of the ear.

1. antitragus.
2. lobule of the ear.
3. head of the mandible.
4. zygomatic arch.
5. tragus.



## INDIVIDUAL CRANIAL BONES

Fig.(68): FRONTAL BONE (external aspect)

It forms the forehead, roof of the orbits and anterior part of norma verticalis. At birth it consists of 2 halves separated from each other by the metopic suture, but it becomes one bone by 8th year.

1. remnant of metopic suture (persists in 10% of cases).
2. zygomatic process of frontal bone.
3. supra-orbital margin.
4. nasal part (articulates with the 2 nasal bones).
5. maxillary process of frontal bone.
6. supra-orbital notch or foramen.
7. site of frontonasal suture.

\* Note that frontal bone lodges the frontal air sinus.

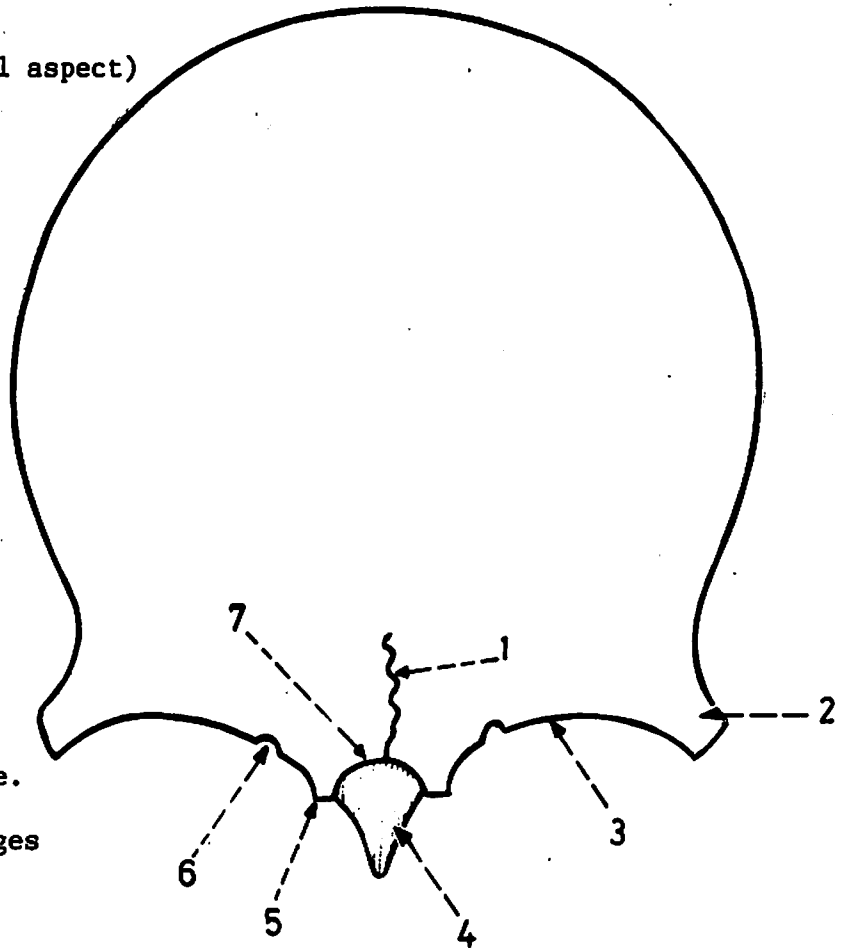


Fig.(69): SPHENOID BONE (posterior aspect)

It is a single bone which lies in the middle of the base of the skull and consists of a body, 2 greater wings, 2 lesser wings and 2 pterygoid processes. Each pterygoid process consists of a lateral plate and a medial plate.

1. lesser wing.
2. greater wing.
3. lateral pterygoid plate.
4. medial pterygoid plate.
5. body of sphenoid (lodges the sphenoidal air sinus).
6. pterygoid hamulus.
7. spine of sphenoid.
8. foramen spinosum.
9. foramen ovale.
10. foramen rotundum.
11. superior orbital fissure.
12. optic canal.
13. hypophyseal fossa.

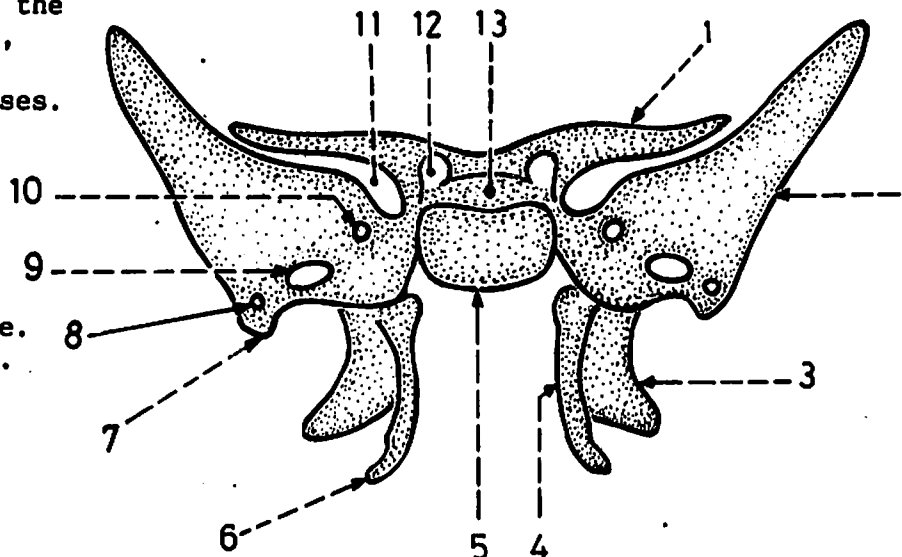


Fig.(70): MAXILLA (lateral aspect)

There are 2 maxillae which unite together to form the upper jaw. Each maxilla lodges the maxillary air sinus and consists of a body and 4 processes: alveolar, frontal, zygomatic and palatine.

1. alveolar process (upper jaw).
2. nasal spine.
3. frontal process (articulates with the frontal bone).
4. orbital surface (forms part of the floor of the orbit).
5. zygomatic process (articulates with the zygomatic bone).
6. posterior surface (shows the posterior superior alveolar canals).
7. maxillary tuberosity (posterior end of the alveolar process).

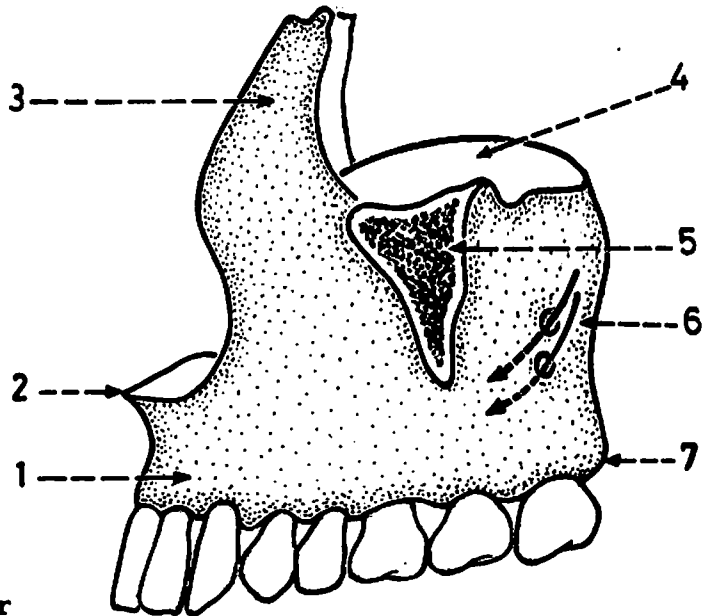


Fig.(71): MAXILLA (medial aspect)

The maxilla forms most of the roof of the mouth, as well as the floor and lateral wall of the nasal cavity.

1. nasolacrimal canal.
2. incisive canal.
3. palatine process of maxilla (forms the anterior part of the hard palate).
4. alveolar process.
5. greater palatine canal (on the back of the maxilla).
6. maxillary air sinus.
7. frontal process of maxilla.

\* Note that the increase in the vertical diameter of the maxilla is responsible for most of the growth of the face in height.

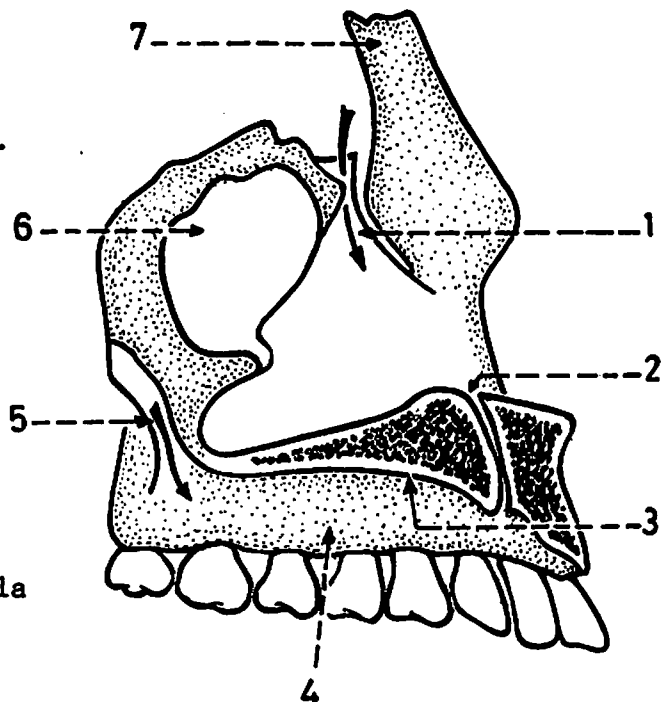


Fig.(72): PALATINE BONE (medial aspect)

It is an L-shaped bone, one on each side. It has a perpendicular plate which lies in the posterior part of the lateral wall of the nasal cavity, and a horizontal plate which forms the posterior part of the hard palate. The perpendicular plate ends above in 2 processes: orbital process in front, sphenoidal process behind and a sphenopalatine notch in between.

1. orbital process of palatine bone (forms the most posterior part of the floor of the orbit).
2. sphenoidal process.
3. sphenopalatine notch (transformed into a foramen by the inferior surface of the body of sphenoid).
4. perpendicular plate of palatine bone.
5. conchal crest (articulates with the inferior nasal concha).
6. pyramidal process (projects between the lower ends of the lateral and medial pterygoid plates).
7. greater palatine groove (converted into a canal by the maxilla).
8. horizontal plate of palatine bone.

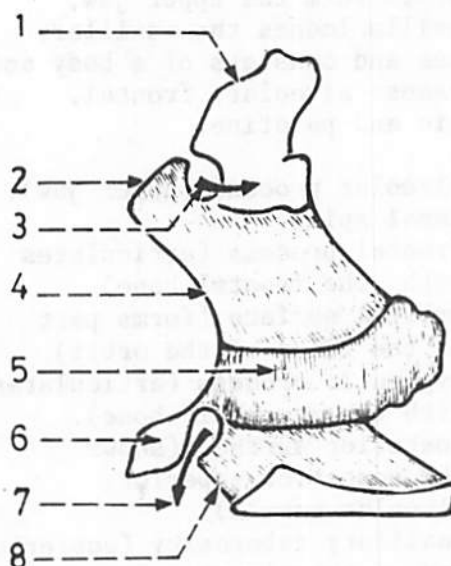


Fig.(73): PALATINE BONE ARTICULATED WITH THE MAXILLA

1. maxilla.
2. perpendicular plate of palatine bone.
3. horizontal plate of palatine bone.
4. greater palatine foramen.
5. incisive canal.

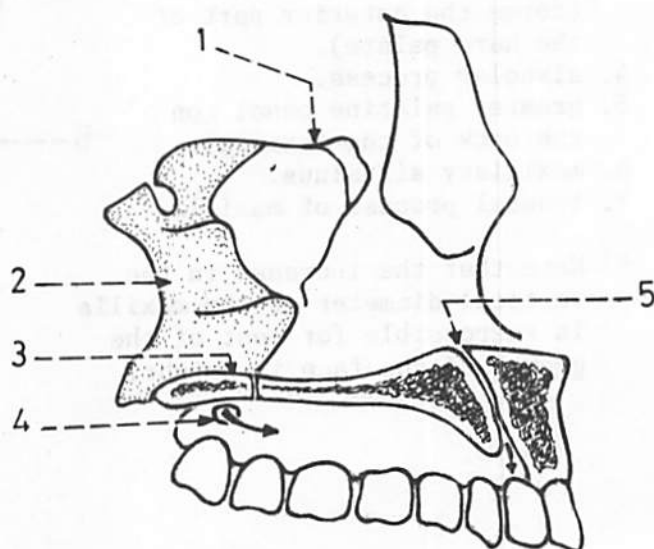


Fig.(74): TEMPORAL BONE (external aspect)

There are 2 temporal bones, one on each side. Each bone forms a part of the side and base of the skull, and consists of the following parts: squamous part, petrous part, mastoid part, tympanic plate and styloid process.

1. squamous part (forms part of the temporal fossa).
2. zygomatic process.
3. external acoustic meatus.
4. tympanic plate (forms part of the wall of the external acoustic meatus).
5. styloid process.
6. mastoid part (forms the posterior part of the bone and is continued below into the mastoid process).
7. groove for middle temporal artery.

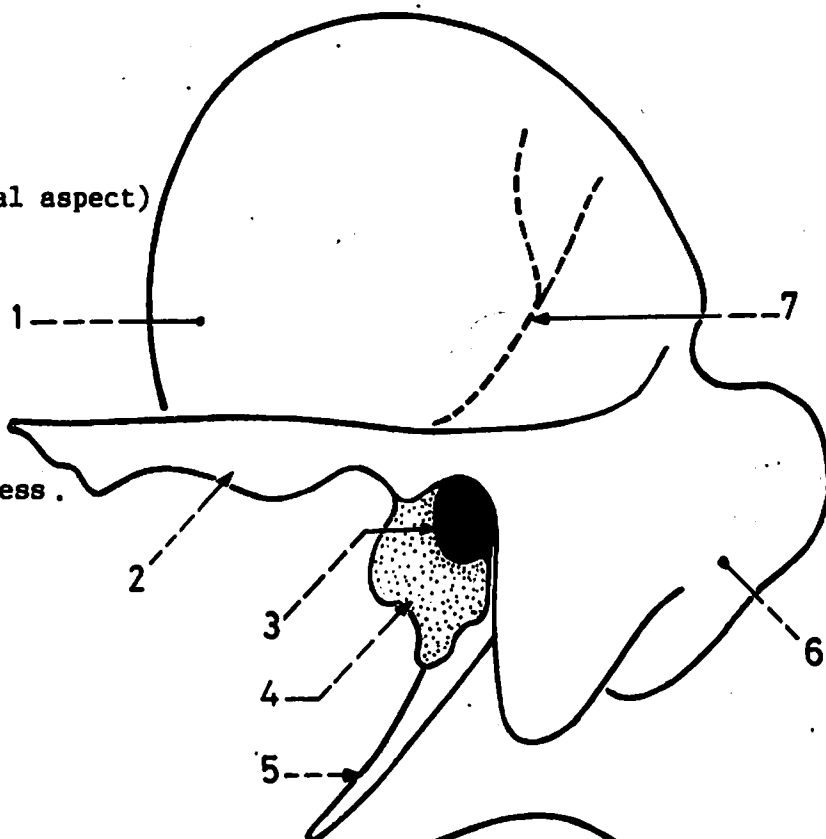


Fig.(75): TEMPORAL BONE (internal aspect)

1. squamous part.
2. petrous part.
3. internal acoustic meatus.
4. styloid process.
5. mastoid part.

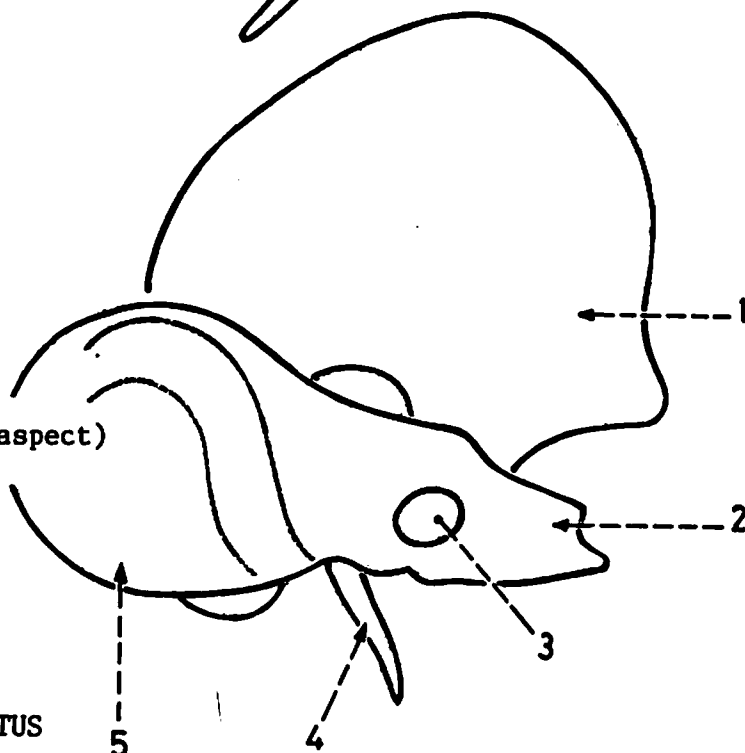


Fig.(76): TEMPORAL BONE OF THE FOETUS

The different parts of the temporal bone ossify separately. Ossification starts in the bone before birth, and the various parts of the bone unite together one year after birth.

1. mastoid part.
2. stylomastoid foramen.
3. petrous part.
4. tympanic plate.
5. squamous part.

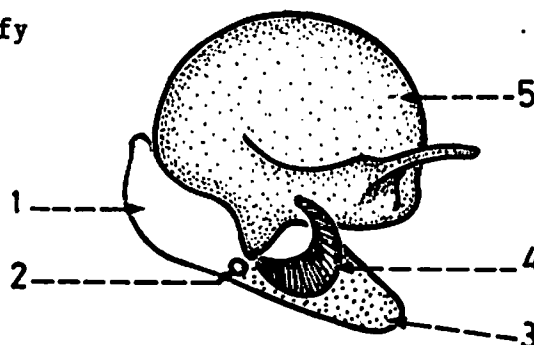


Fig.(77): OCCIPITAL BONE (external aspect)

It forms the back of the skull and the posterior part of its base. It encloses the foramen magnum and consists of 4 parts: basilar, occipital and 2 lateral. It is a single bone.

1. basilar part (in front of the foramen magnum and forms the roof of the pharynx).
2. hypoglossal canal.
3. occipital condyle (articulates with the atlas vertebra to form the atlanto-occipital joint).
4. lateral part (lateral to the foramen magnum).
5. squamous part (behind the foramen magnum).

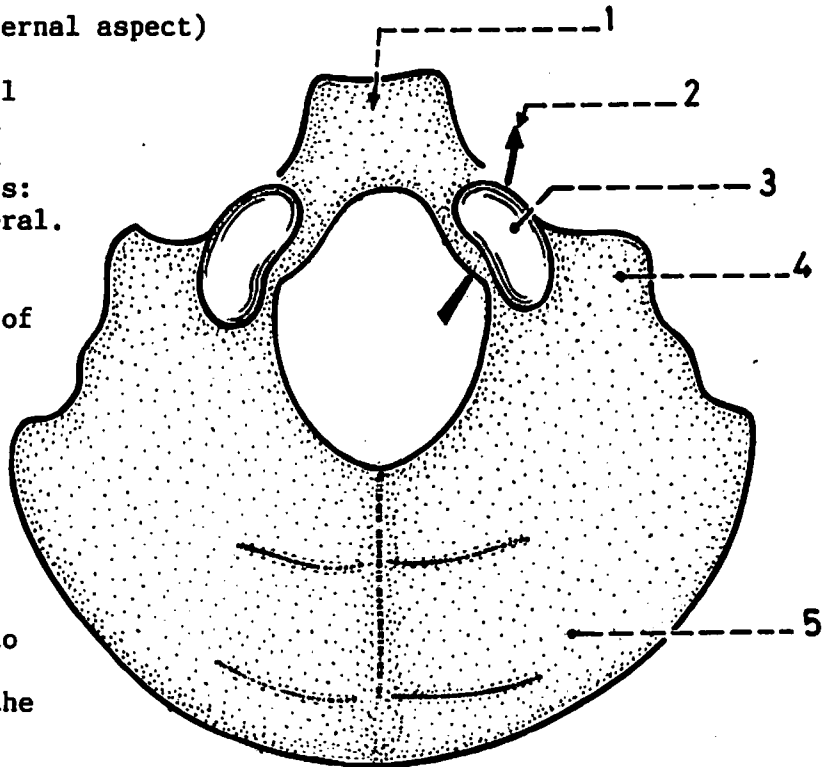
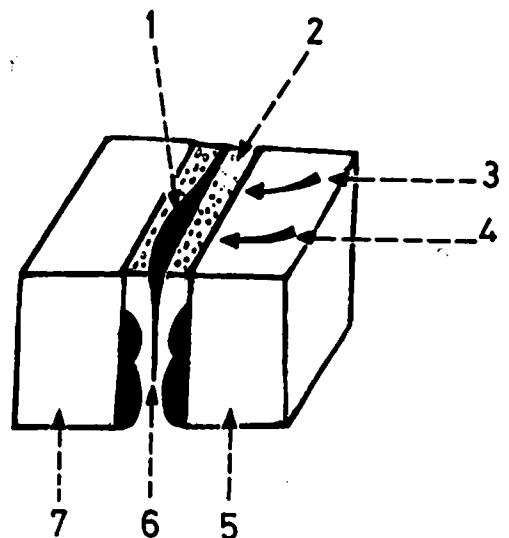


Fig.(78): ETHMOID BONE

It is a single bone which lies in the anterior part of the base of the skull. It forms part of the medial wall of the orbit. It also forms parts of the roof and lateral walls of the nasal cavity as well as a part of the nasal septum. It consists of 4 parts: a horizontal part (cribriform plate), a perpendicular part and 2 lateral masses called labyrinths.

1. crista galli (projects upwards from the midline of the cribriform plate).
2. cribriform plate (a horizontal perforated lamina which forms a part of the roof of the nasal cavity).
3. arrow representing the posterior ethmoidal canal.
4. arrow representing the anterior ethmoidal canal.
5. lateral mass or labyrinth of ethmoid (consists of ethmoidal air cells arranged in 3 groups called anterior, middle and posterior ethmoidal sinuses).
6. perpendicular plate (projects downwards from the midline of the cribriform plate to form a part of the nasal septum).





# SEX FEATURES

Fig.(79): SEX FEATURES OF THE SKULL

1. the superciliary arches are more prominent in the male than in the female.
2. the supra-orbital margin is sharp in the female but blunt in the male.
3. the male skull is larger in size and its capacity is 10% more than that of the female.
4. the muscular ridges in the nuchal area are more marked in the male than in the female.
5. the mastoid process is larger and more prominent in the male than in the female.

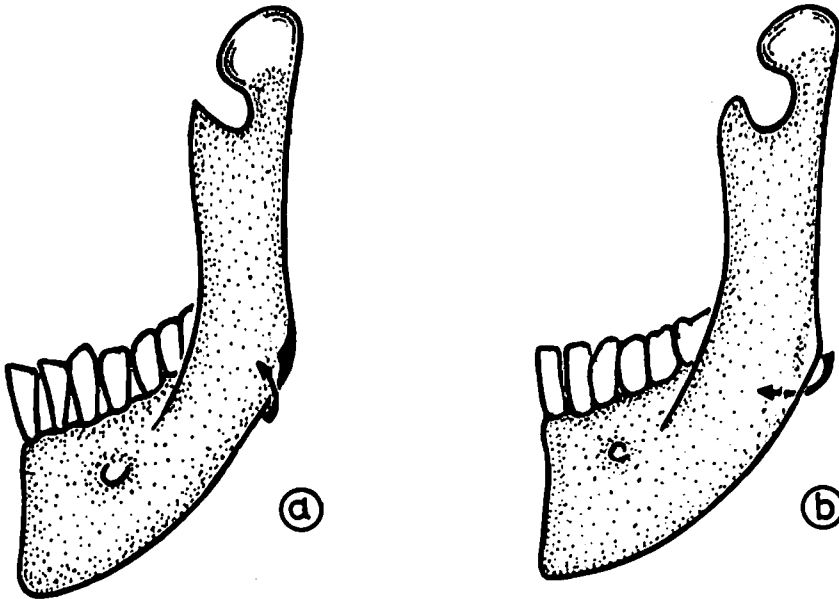
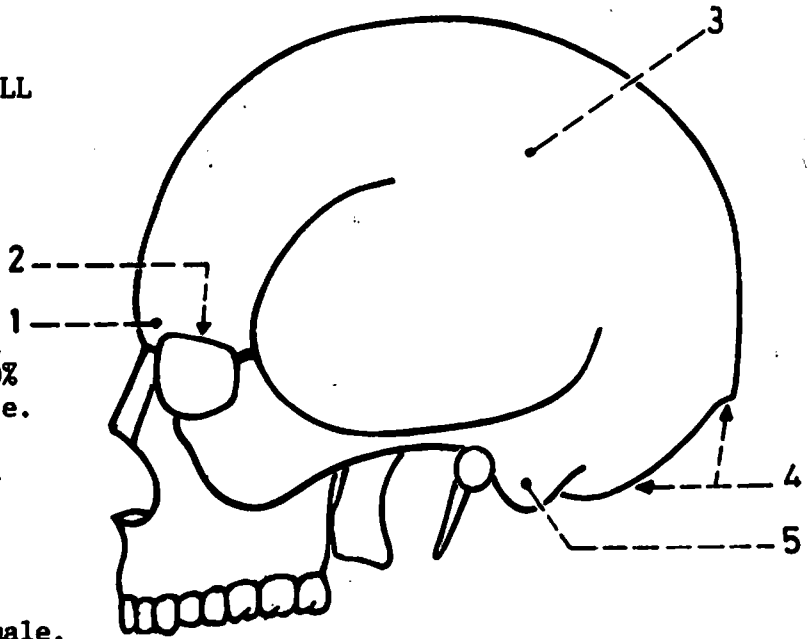


Fig.(80): SEX FEATURES OF THE MANDIBLE

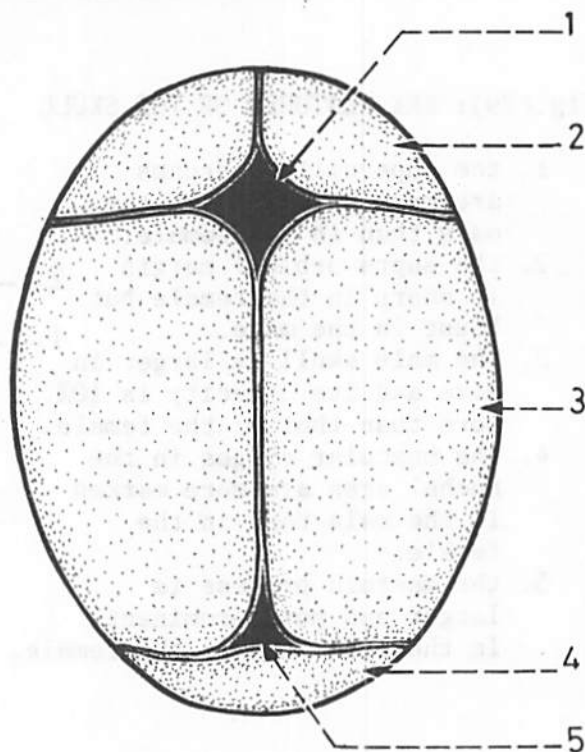
The male mandible is heavier with more marked muscular impressions. The angle of the mandible is said to be everted in the male (a) and inverted in the female (b).

## AGE CHANGES IN THE SKULL

Fig.(81): THE SKULL AT BIRTH

(a) Top view

1. anterior fontanelle: lozenge-shaped area at the meeting of the coronal, sagittal and metopic sutures. It is closed about 18 months after birth.
2. one-half of the frontal bone.
3. parietal bone.
4. occipital bone.
5. posterior fontanelle: triangular area at the meeting of the sagittal and lambdoid sutures. It is closed about 3 months after birth.



(b) Side view

1. frontal bone.
2. anterior fontanelle (corresponds to bregma).
3. parietal bone.
4. posterior fontanelle (corresponds to lambda).
5. mastoid fontanelle: at the posterior inferior angle of the parietal bone corresponding to the asterion. It is closed by the end of the 1st year.
6. occipital bone.
7. temporal bone.
8. sphenoidal fontanelle: at the anterior inferior angle of the parietal bone corresponding to the pterion. It is closed within 3 months after birth.

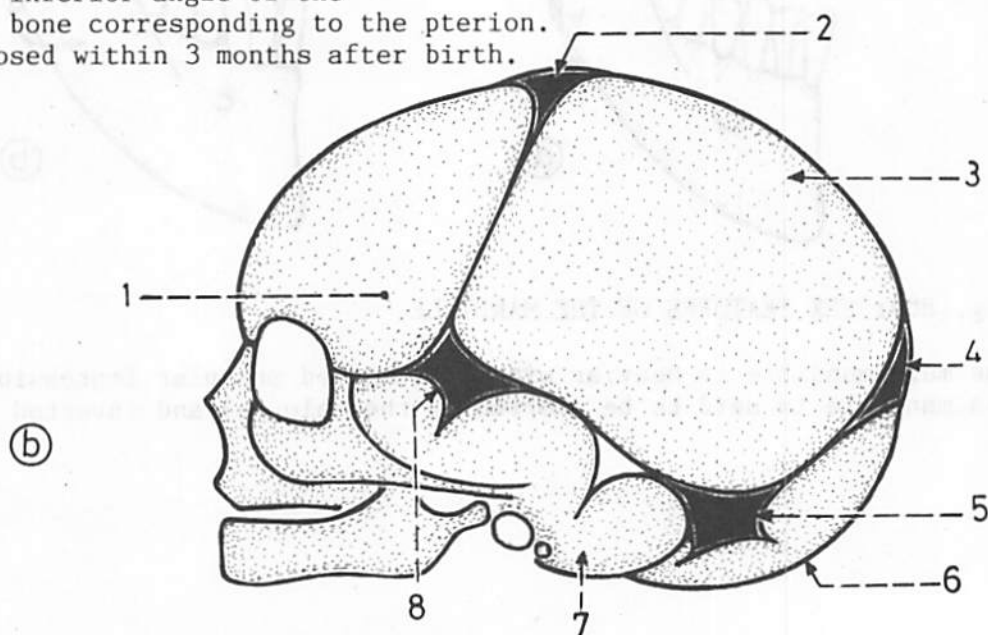


Fig.(82): GROWTH OF THE CALVARIA

The growth of the calvaria (brain box) is related to the growth of the brain and takes place at the main sutures of the skull.

1. coronal suture: contributes to growth in length.
2. sagittal suture: contributes to growth in breadth.
3. suture between the parietal and temporal bones: contributes to growth in height.
4. lambdoid suture: contributes to growth in length.

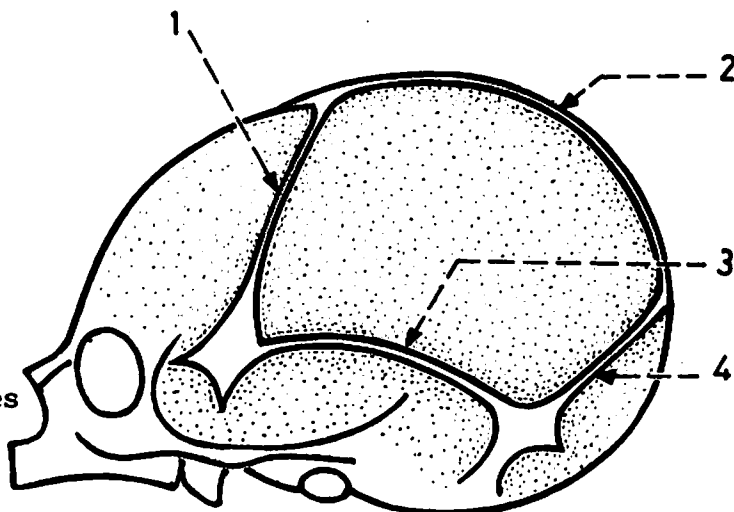


Fig.(83): FACIAL SKELETON AT BIRTH

The facial skeleton is  $\frac{1}{8}$  the size of the cranium at birth but it is  $\frac{1}{2}$  in the adult. The small size of the face is due to the rudimentary maxilla, non-eruption of the teeth and small size of the nasal cavity and nasal sinuses.

1. calvaria.
2. facial skeleton.

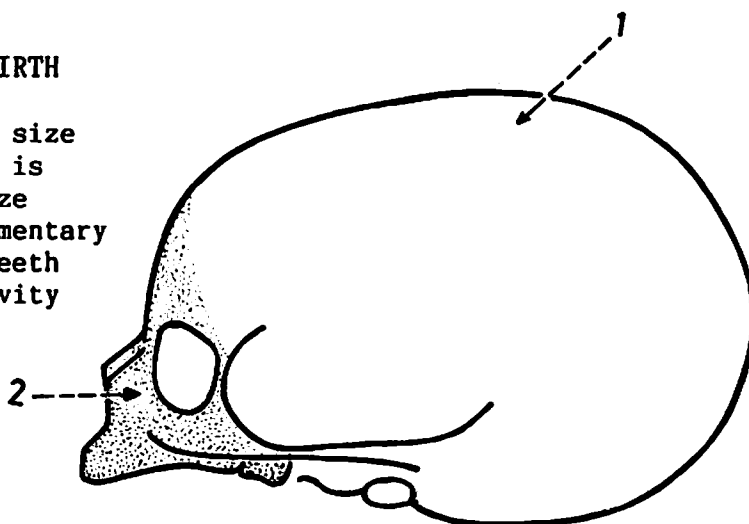


Fig.(84): FACIAL SKELETON IN THE ADULT

The maxilla is the main bone responsible for the growth of the facial skeleton. This is due to enlargement of the maxillary air sinus as well as to growth of the alveolar process as a result of eruption of permanent teeth.

1. calvaria.
2. facial skeleton.

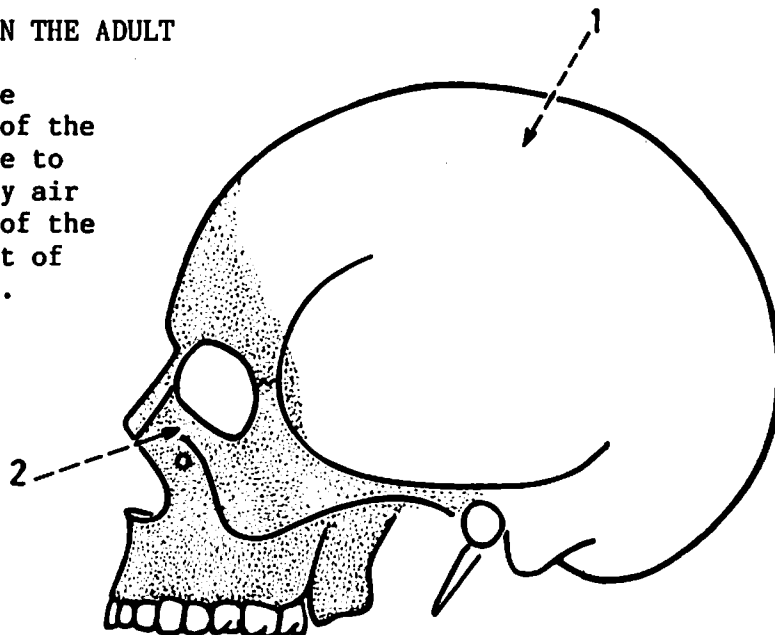


Fig.(85): GROWTH OF THE BASE OF THE SKULL

The growth of the skull base takes place at the disc of cartilage between the basilar part of occipital bone and the body of sphenoid (spheno-occipital junction). It is a synchondrosis which ossifies by about 25 years and is responsible for the growth of the base in length.

1. vomer.
2. body of sphenoid.
3. spheno-occipital synchondrosis.
4. basilar part of occipital bone.

\* Note that the base of the skull ossifies in cartilage while the vault ossifies in membrane.

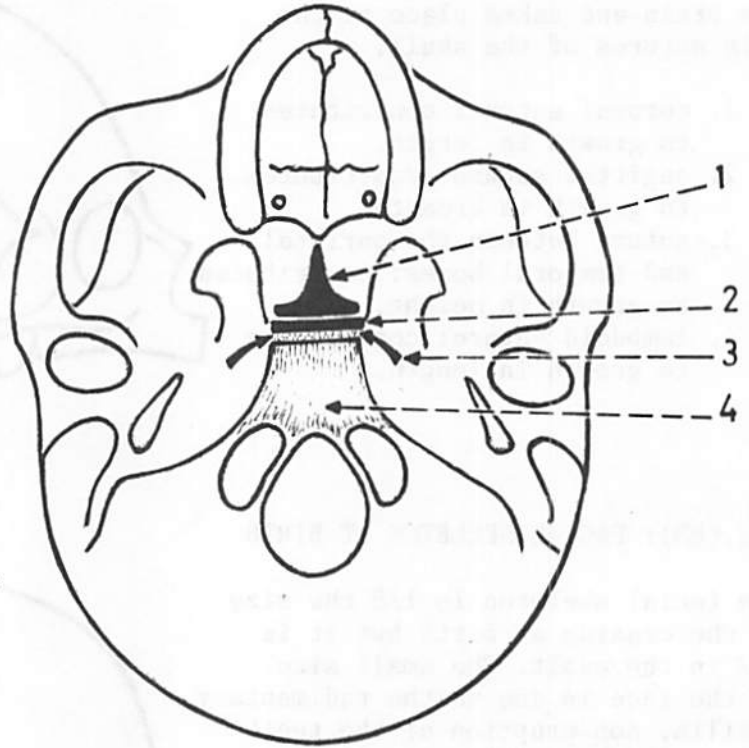
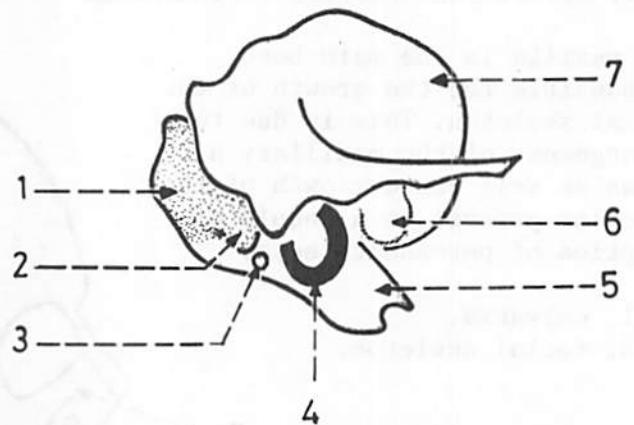


Fig.(86): TEMPORAL BONE AT BIRTH

At birth the tympanic plate is in the form of an incomplete ring and the mastoid process is not yet formed, thus the stylomastoid foramen is exposed on the lateral surface of the skull (instead of opening on the base). The mandibular fossa is flat and faces more laterally.

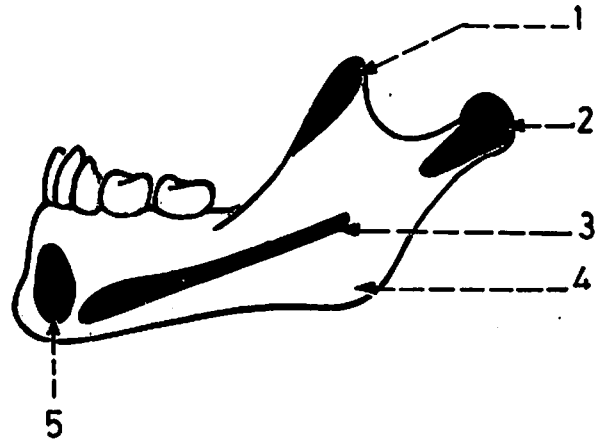
1. mastoid part of temporal bone.
2. rudimentary mastoid process (it is developed by the 2nd year).
3. stylomastoid foramen facing laterally.
4. tympanic plate (incomplete ring).
5. petrous part of temporal bone.
6. mandibular fossa (flat and the articular tubercle is not developed).
7. squamous part of temporal bone.



\* Note that at birth the internal ear, tympanic cavity, mastoid antrum and the auditory ossicles are almost of the adult size.

Fig.(87): OSSIFICATION OF THE MANDIBLE

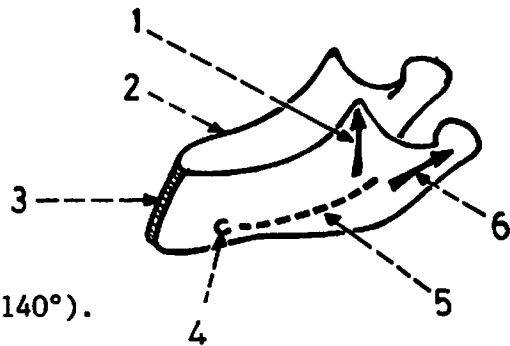
It ossifies partly in membrane and partly in cartilage. The cartilagenous centres are represented by Meckel's cartilage and accessory cartilages which appear in the condylar and coronoid processes as well as close to the symphysis menti. At birth the mandible is formed of 2 halves which unite together at the symphysis menti before the end of the 1st year (bony union).



1. accessory cartilage in the coronoid process.
2. accessory cartilage in the condylar process.
3. Meckel's cartilage.
4. membranous bone.
5. accessory cartilage close to the symphysis menti.

Fig.(88): THE MANDIBLE AT BIRTH

It consists of 2 separate halves which unite together at the symphysis menti by fibrous tissue. The ramus forms an obtuse angle with the lower border of the body of the mandible ( $140^\circ$ ).



1. coronoid process (projects above the level of the head of the mandible).
2. absent alveolar process.
3. symphysis menti (fibrous tissue).
4. mental foramen (near the lower border).
5. mandibular canal (near the lower border).
6. condylar process (directed mainly backwards and slightly upwards).

Fig.(89): GROWTH OF THE MANDIBLE

1. formation of the alveolar process (due to eruption of permanent teeth).
2. deposition of new bone along the lower border of the body thus displacing the mental foramen and the mandibular canal upwards.
3. deposition of new bone along the posterior border of the ramus accompanied by absorption of bone along its anterior border. This leads to lengthening of the alveolar process and the angle of the mandible becomes a right angle.

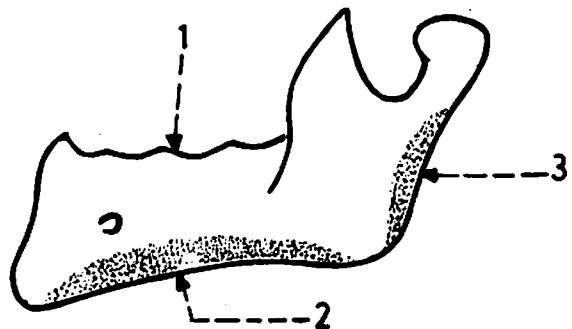


Fig.(90): THE MANDIBLE IN THE ADULT

1. mental foramen: opens midway between the upper and lower borders of the body.
2. alveolar process: forms about  $1/2$  of the height of the body.
3. posterior border of the ramus: becomes more vertical.
4. mandibular canal: runs midway between the upper and lower borders of the body.
5. angle of the mandible: is a right angle.

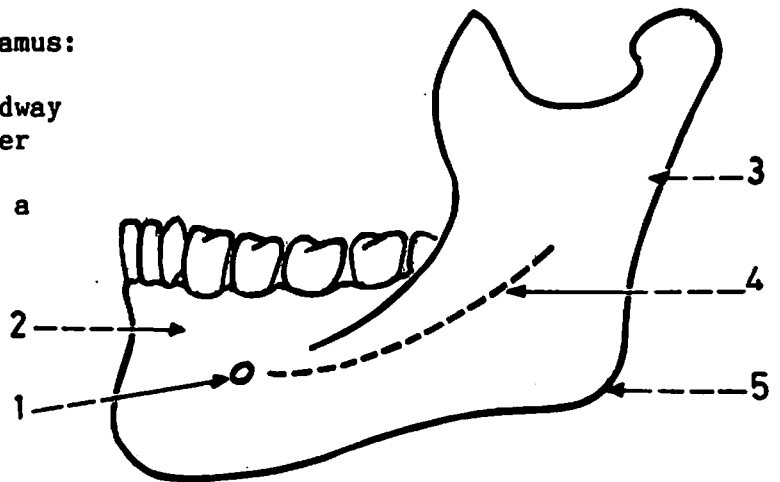


Fig.(91): THE MANDIBLE IN OLD AGE

1. alveolar process: is absorbed due to loss of teeth.
2. mental foramen: comes to lie near the upper border of the body.
3. mandibular canal: comes to lie close to the upper border of the body.
4. angle of the mandible: becomes obtuse again and measures about  $140^\circ$ .
5. posterior border of the ramus: becomes oblique in direction.

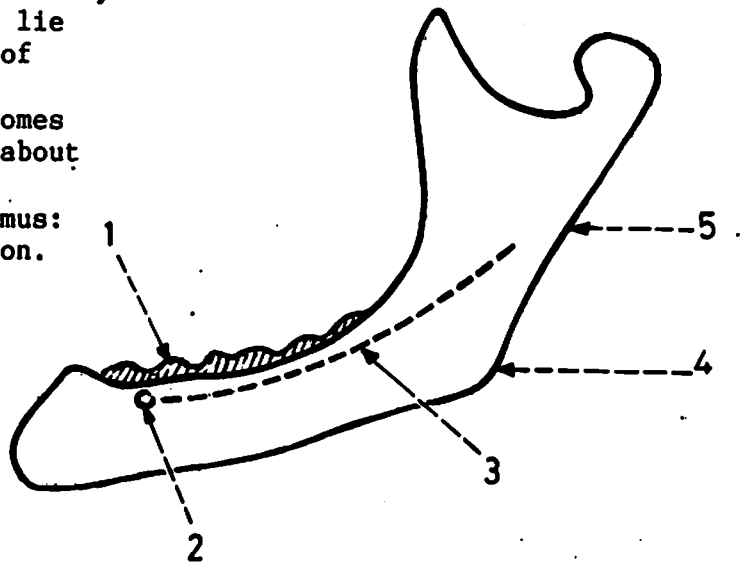
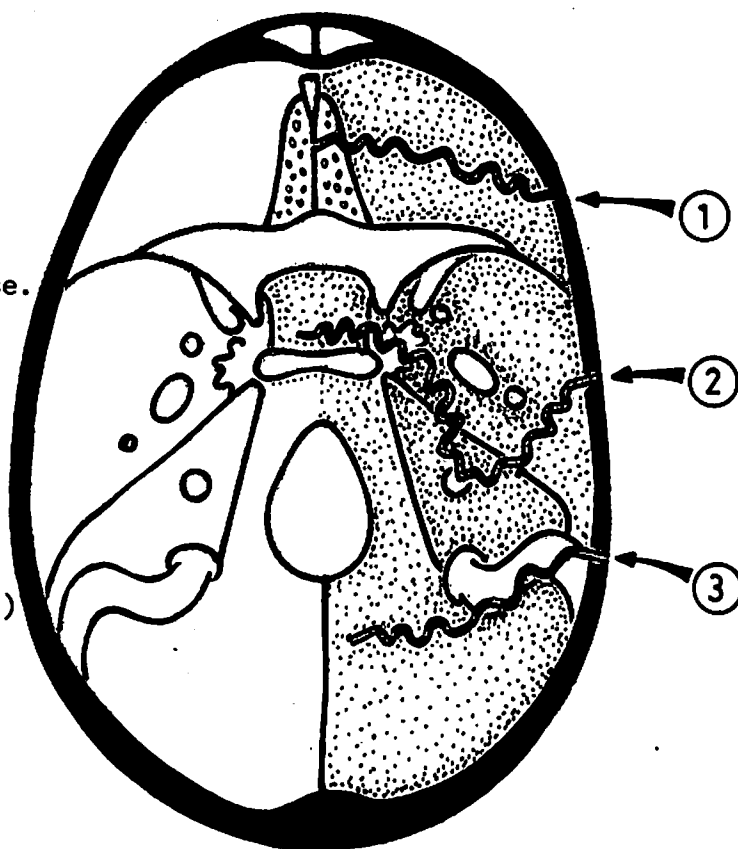


Fig.(92): FRACTURE OF SKULL BASE

Fracture base usually takes place through the middle cranial fossa because of its weakness as a result of the presence of numerous foramina and canals.

1. fracture through the anterior cranial fossa: passes through the cribriform plate of ethmoid leading to bleeding from the nose.
2. fracture through the middle cranial fossa: passes through the squamous part and petrous part of temporal bone, and may extend to the internal acoustic meatus as well as to the body of the sphenoid. As a result, there may be bleeding from the external acoustic meatus (due to involvement of the middle ear) and from the nose (due to involvement of the sphenoidal air sinus).
3. fracture through the posterior cranial fossa: passes through the sigmoid sinus leading to haemorrhage and collection of blood around the mastoid process.



- \* Note that the skull is constructed in such a form as to resist fracture. It is rounded in shape and consists of a number of separate bones each of which forms an elastic arch.

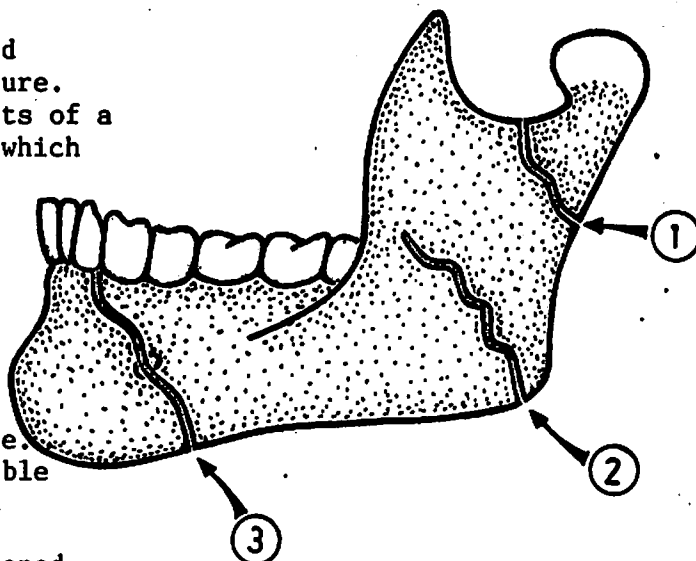


Fig.(93): FRACTURE OF THE MANDIBLE

1. fracture of the ramus below the condylar process.
2. fracture of the ramus at the angle.
3. fracture of the body of the mandible at the socket of the canine tooth (this is the most common site for fracture because the bone is weakened by the deep socket of the canine).

## HYOID BONE

Fig.(94): PARTS OF THE HYOID BONE

The hyoid bone is U-shaped and consists of a body, 2 greater horns and 2 lesser horns. The lesser horn is attached at the junction of the body of the bone and the greater horn.

1. greater horn (cornu).
2. lesser horn (cornu).
3. body of the hyoid.

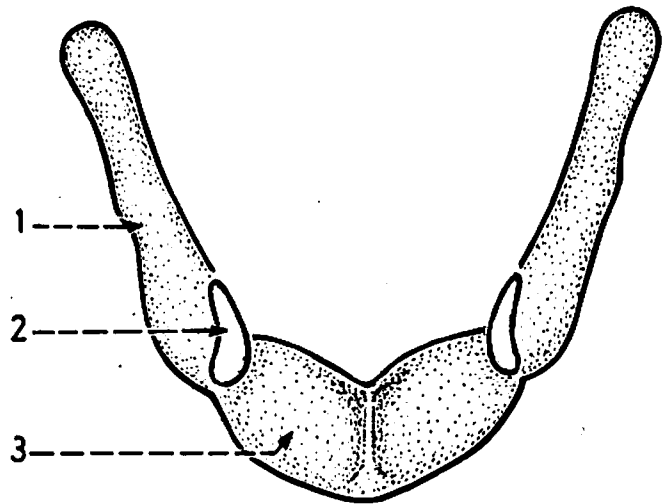


Fig.(95): MUSCLES AND LIGAMENTS ATTACHED TO THE HYOID BONE

1. origin of middle constrictor muscle of the pharynx.
2. insertion of geniohyoid muscle.
3. origin of hyoglossus muscle.
4. insertion of stylohyoid muscle.
5. insertion of superior belly of omohyoid muscle.
6. insertion of mylohyoid muscle.
7. insertion of sternohyoid muscle.

\* Note that the stylohyoid ligament is attached to the tip of the lesser horn.

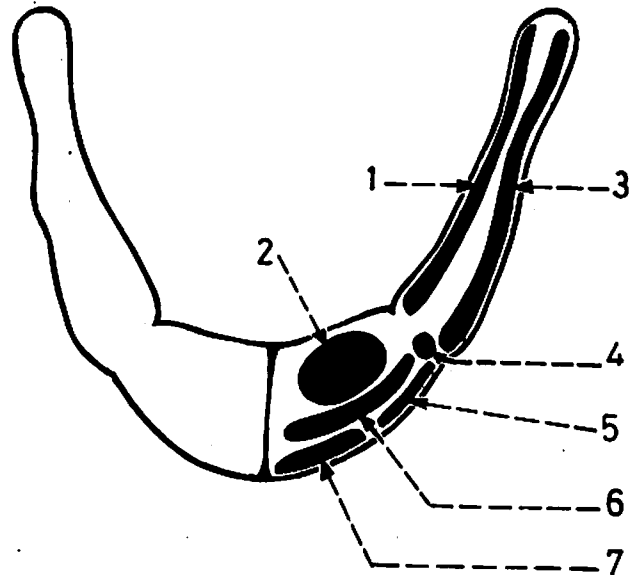
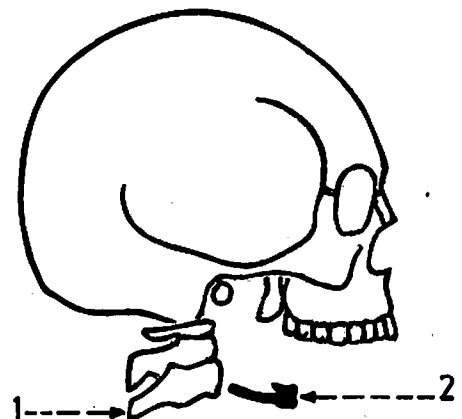


Fig.(96): POSITION OF THE HYOID BONE

It lies in the front of the neck opposite the 3rd cervical vertebra.

1. 3rd cervical vertebra.
2. hyoid bone.

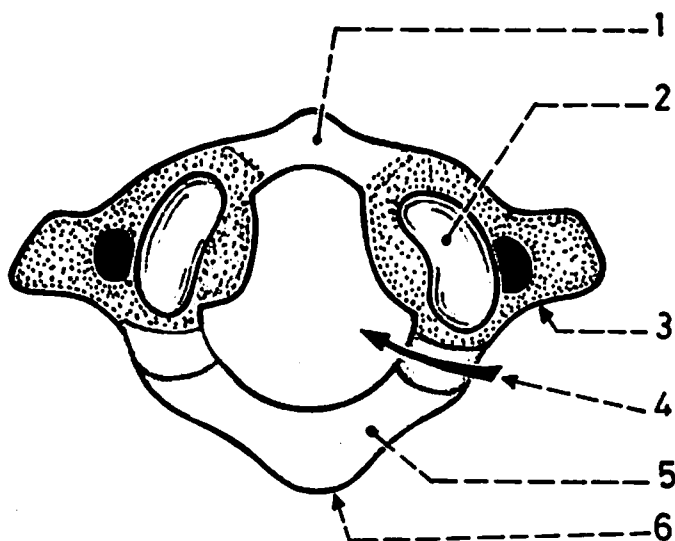




## CERVICAL VERTEBRAE

Fig.(97): ATLAS VERTEBRA (1st C.V.)  
(superior aspect)

1. anterior arch (shows a median anterior tubercle on its anterior surface).
2. kidney-shaped, concave facet for articulation with the occipital condyle to form the atlanto-occipital joint.
3. transverse process (shows a foramen transversarium).
4. groove for the vertebral artery on the upper surface of the posterior arch.
5. posterior arch (larger than the anterior arch).
6. posterior tubercle.



- \* The atlas vertebra is the 1st cervical vertebra and has neither a body nor a spine.

Fig.(98): ARTICULATION WITH THE DENS  
OF THE AXIS VERTEBRA

The dens of the axis vertebra articulates with the facet on the posterior surface of the anterior arch of the atlas vertebra to form the median atlanto-axial joint.

1. facet for articulation with the dens.
2. dens of axis vertebra.
3. transverse ligament of the atlas.

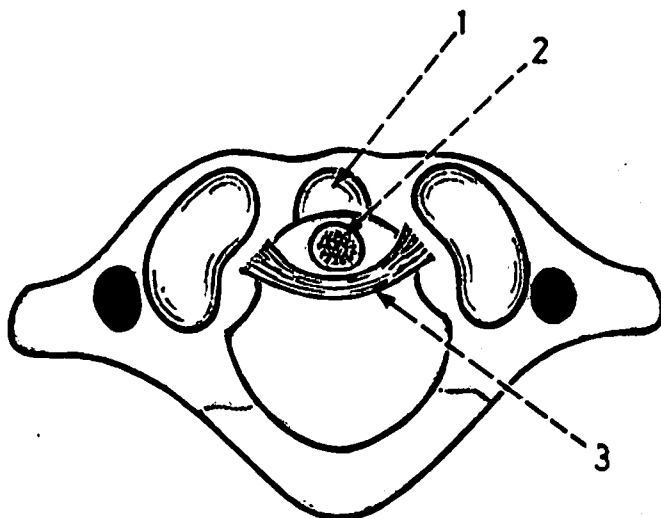


Fig.(99): TIP OF THE TRANSVERSE  
PROCESS OF ATLAS VERTEBRA

It can be felt midway between the tip of mastoid process and the angle of the mandible.

1. mastoid process.
2. tip of transverse process of atlas vertebra.
3. angle of mandible.

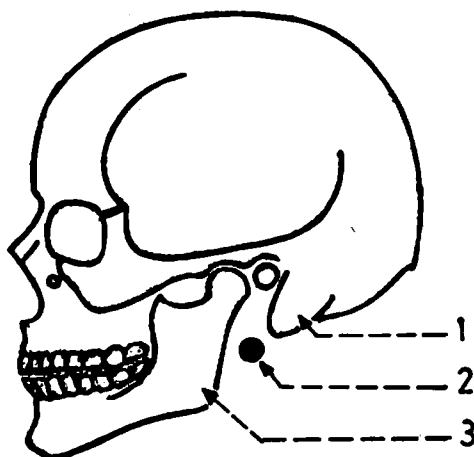


Fig.(100): AXIS VERTEBRA (2nd C.V.)  
(superior aspect)

1. small transverse process.
2. arrow representing the vertebral artery.
3. flat facet for articulation with the inferior facet of the atlas to form the lateral atlanto-axial joint.
4. dens.

\* The axis is characterized by having a dens and a strong bifid spine.

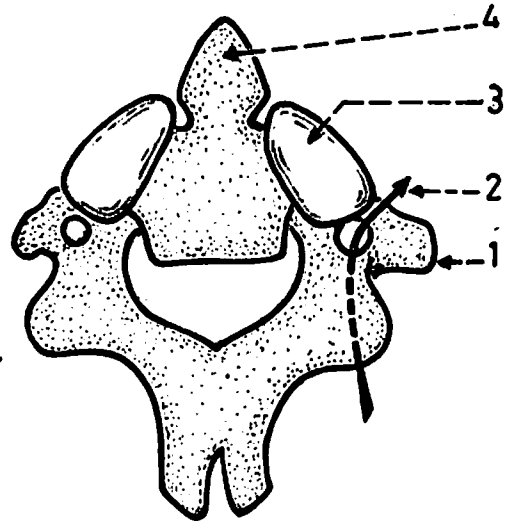


Fig.(101): ATLANTO-AXIAL JOINTS

These are median and 2 lateral atlanto-axial joints.

1. median atlanto-axial joint (between the dens and anterior arch of the atlas).
2. lateral mass of the atlas.
3. lateral atlanto-axial joint.
4. body of axis.

\* At these 3 joints rotation of the atlas on the axis takes place. However, the atlanto-occipital joint allows nodding movement.

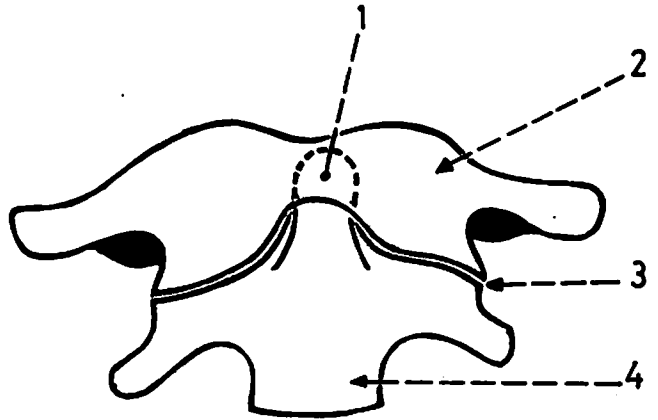
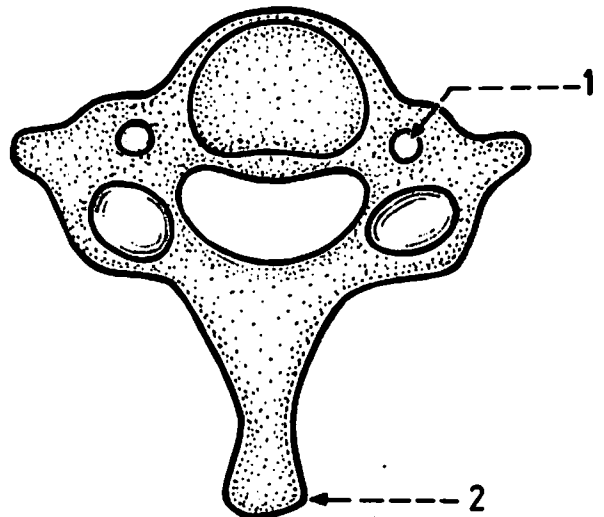


Fig.(102): VERTEBRA PROMINENS (7th C.V.)

It is characterized by having a long spine (not bifid) and a small foramen transversarium.

1. small foramen transversarium.
2. long prominent spine.

\* The spine of this vertebra runs horizontally backwards and its tip can be felt at the lower end of the back of the neck.



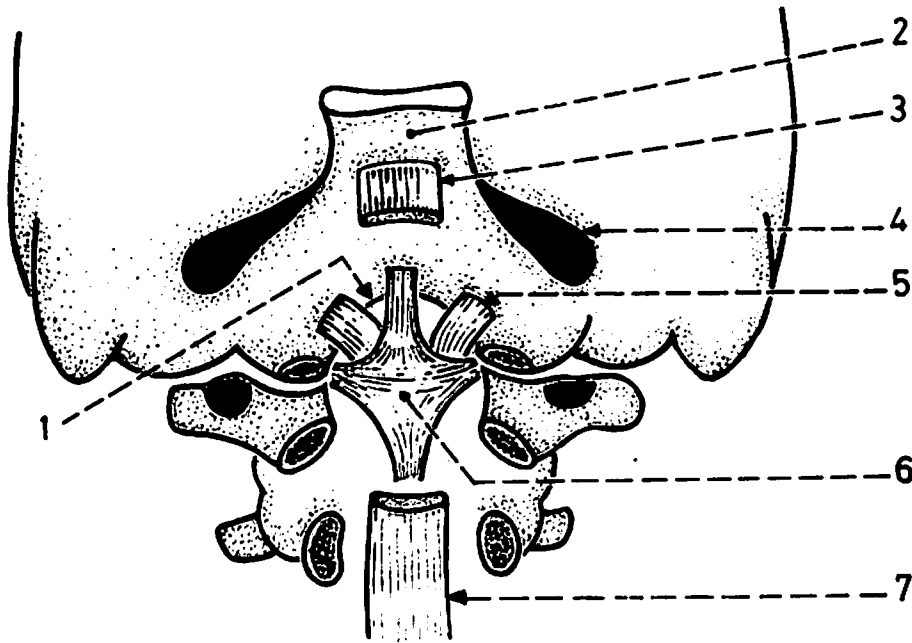


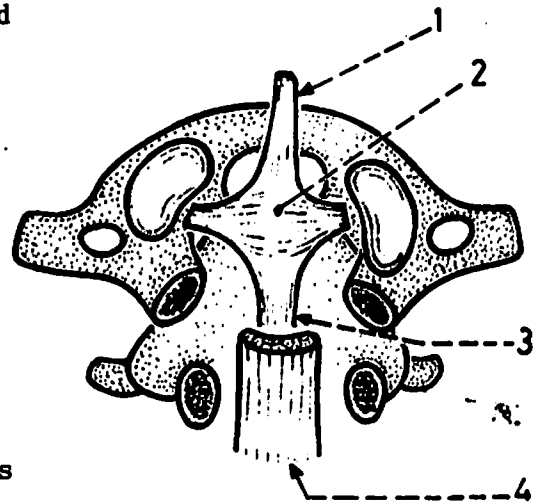
Fig.(103): LIGAMENTS ATTACHED TO THE UPPER SURFACE OF BASILAR PART OF OCCIPITAL BONE

These are the membrana tectoria, 2 alar ligaments and superior band of the cruciform ligament of the atlas.

1. anterior margin of the foramen magnum.
2. clivus.
3. upper attachment of the membrana tectoria (its lower attachment is to the back of the body of the axis vertebra).
4. jugular foramen.
5. alar ligament (from the side of the dens to the medial side of the occipital condyle).
6. cruciform ligament of the atlas (see fig.104).
7. posterior longitudinal ligament (continued upwards as the membrana tectoria).

Fig.(104): CRUCIFORM LIGAMENT OF THE ATLAS

It is cross-like (+) having a vertical part and a horizontal part.



1. superior band of cruciform ligament (attached to the basilar part of occipital bone).
2. transverse ligament of atlas (extends transversely between the 2 lateral masses of the atlas, behind the dens).
3. inferior band of cruciform ligament (attached to the body of the axis).
4. posterior longitudinal ligament (ends at the body of the axis).

\* The cruciform ligament is covered by the membrana tectoria which is the upward continuation of the posterior longitudinal ligament.

Fig.(105): LIGAMENTS ATTACHED TO THE AXIS VERTEBRA

1. apical ligament (from the tip of the dens to the anterior margin of the foramen magnum).
2. alar ligament (from the side of the dens to the medial side of the occipital condyle).
3. dens.
4. lower part of membrana tectoria (attached to the body of the axis).
5. upper end of the posterior longitudinal ligament (attached to the body of axis).

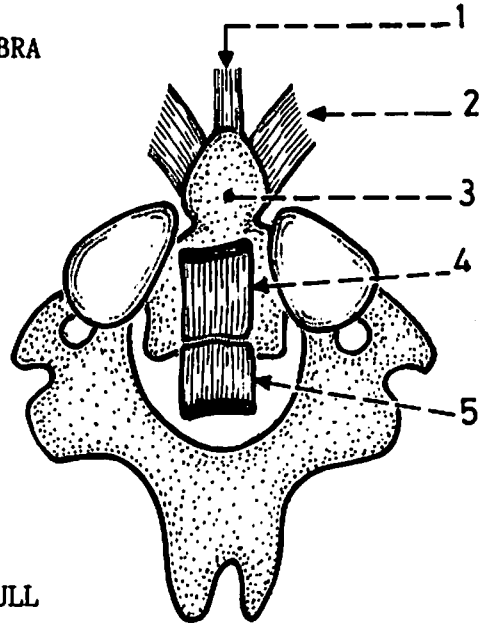


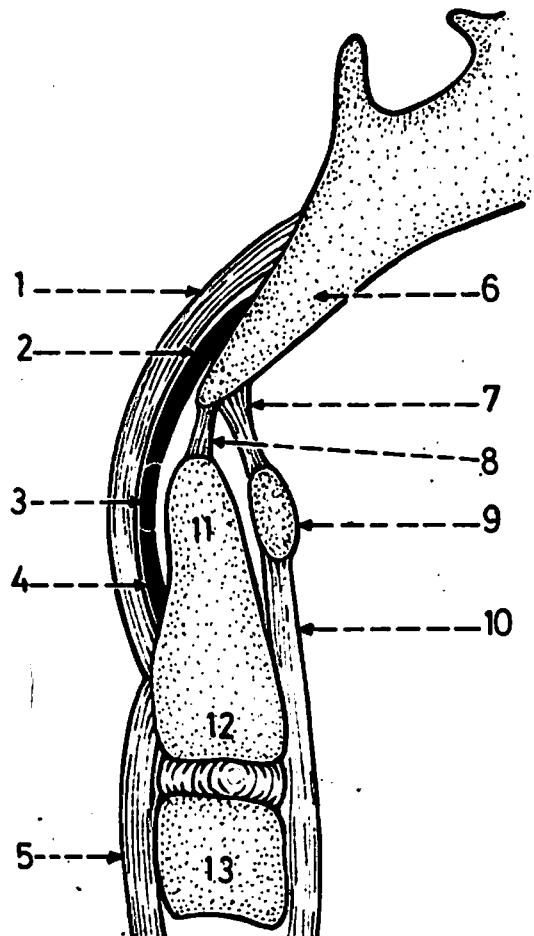
Fig.(106): LIGAMENTS ATTACHING THE ATLAS AND AXIS VERTEBRAE TO THE BASE OF THE SKULL

These are mainly the membrana tectoria, cruciform ligament, apical ligament and atlanto-occipital membranes (anterior and posterior).

1. membrana tectoria (from the body of axis vertebra to the basilar part of occipital bone).
2. superior longitudinal band of cruciform ligament.
3. transverse ligament of atlas.
4. inferior longitudinal band of cruciform ligament.
5. posterior longitudinal ligament.
6. basilar part of occipital bone.
7. anterior atlanto-occipital membrane.
8. apical ligament.
9. anterior arch of atlas.
10. anterior longitudinal ligament.
11. dens.
12. body of axis vertebra.
13. body of 3rd cervical vertebra.

\* The above-mentioned ligaments support the atlanto-axial and atlanto-occipital joints.

\* The membrana tectoria appears to be the upward continuation of the posterior longitudinal ligament.



# **REGIONAL ANATOMY**

## SCALP

Fig.(107): LAYERS OF THE SCALP

The scalp consists of 5 layers: skin, dense connective tissue, occipitofrontalis muscle and its aponeurosis, loose areolar tissue and pericranium.

1. skin.
2. dense connective tissue (superficial fascia).
3. aponeurosis of occipitofrontalis muscle (epicranial aponeurosis).
4. subaponeurotic space (loose areolar tissue).
5. pericranium (periosteum).
6. bone of the vault.

\* The superficial 3 layers are firmly united together.

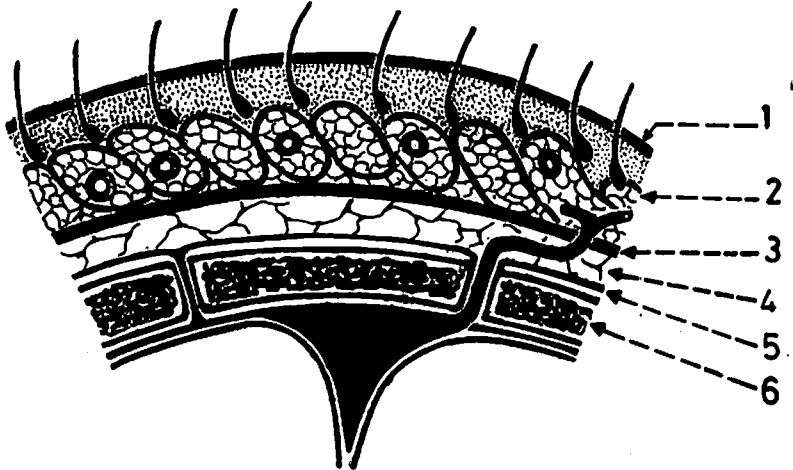


Fig.(108): DANGEROUS AREA OF THE SCALP

This is the subaponeurotic space which contains loose areolar tissue and is traversed by emissary veins. This space allows accumulation of large amounts of pus or blood in case the traversing emissary vein is cut.

1. subaponeurotic space.
2. dense subcutaneous tissue (firmly fused with the epicranial aponeurosis).
3. emissary vein traversing the subaponeurotic space.

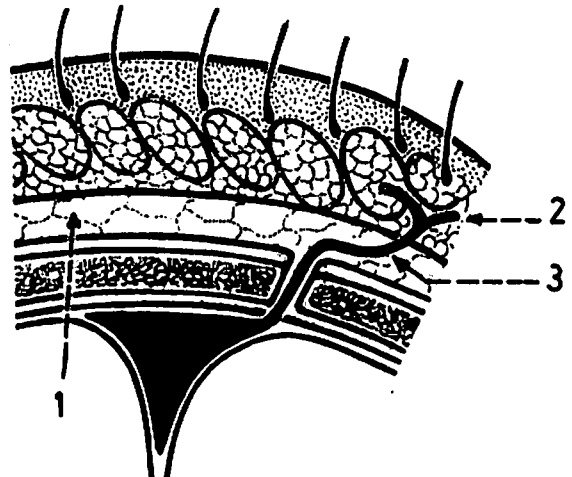
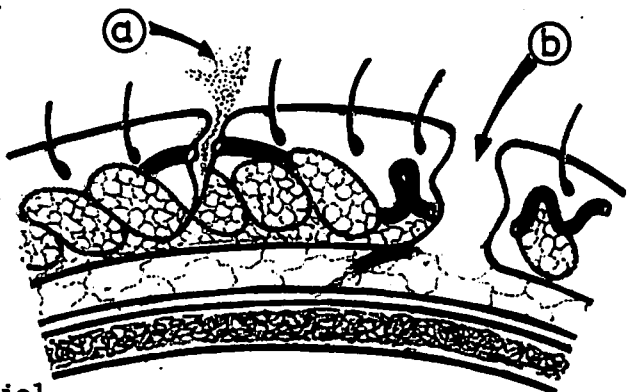


Fig.(109): CUT WOUNDS IN THE SCALP

- (a) A cut wound in the subcutaneous tissue without involving the epicranial aponeurosis: there is profuse haemorrhage and the wound does not gape.
- (b) A cut wound involving the epicranial aponeurosis: there is less haemorrhage and the wound gapes widely. Haemorrhage is less because of retraction of the blood vessels.



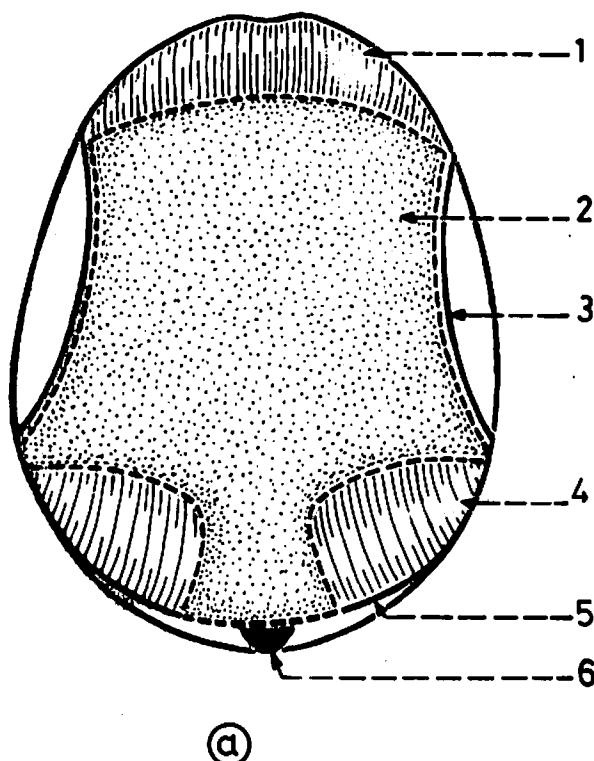
**Fig.(110): OCCIPITOFRONTALIS MUSCLE  
AND EPICRANIAL APONEUROSIS**

The occipitofrontalis is the muscle of the scalp. It consists of 2 occipital bellies behind, and 2 frontal bellies in front, with the epicranial aponeurosis in between.

**(a) Top view:**

1. frontal belly of occipito-frontalis (arises from the epicranial aponeurosis and ends by blending with the orbicularis oculi muscle).
2. epicranial aponeurosis (attached behind to the external occipital protuberance and highest nuchal line, and on each side to the superior temporal line. In front, it encloses the frontal bellies).
3. superior temporal line.
4. occipital belly of occipito-frontalis (arises from the superior or highest nuchal line).
5. superior nuchal line.
6. external occipital protuberance.

\* The 2 frontal bellies are continuous together, while the occipital bellies are separated from each other by the epicranial aponeurosis.



**(b) Side view:**

1. frontal belly.
2. temporal branch of facial nerve.
3. posterior auricular branch of facial nerve.
4. occipital belly.
5. epicranial aponeurosis.

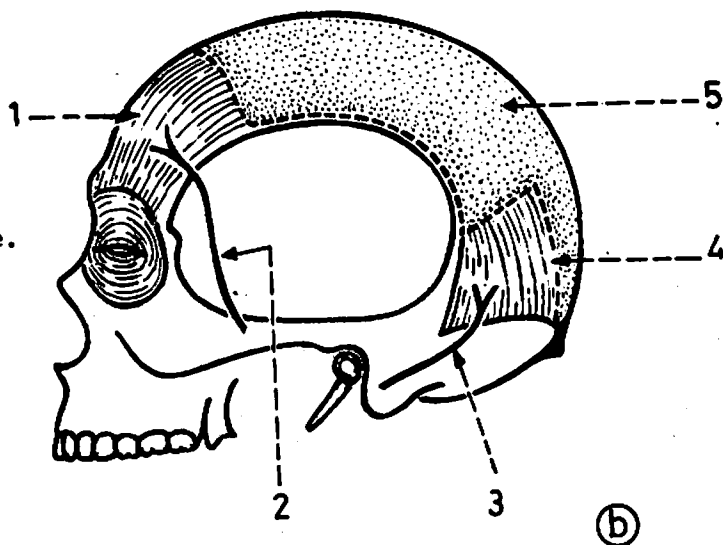


Fig.(111): SENSORY NERVES OF THE SCALP

There are 4 sensory nerves in front of the auricle and 4 sensory nerves behind the auricle. In addition there is one motor nerve in front of the auricle and one behind it.

(a) Sensory nerves in front of the auricle:

1. supratrochlear nerve  
(from the frontal branch of the ophthalmic nerve).
2. supraorbital nerve  
(from the frontal branch of the ophthalmic nerve).
3. zygomaticotemporal nerve  
(from the zygomatic branch of the maxillary nerve).
4. auriculotemporal nerve  
(from the mandibular nerve).

\* The motor nerve of the scalp in front of the auricle is the temporal branch of the facial nerve.

(b) Sensory nerves behind the auricle:

1. greater occipital nerve  
(from 2nd cervical).
2. 3rd occipital nerve  
(from 3rd cervical).
3. lesser occipital nerve  
(from 2nd cervical).
4. great auricular nerve  
(from 2nd and 3rd cervical).

\* The motor nerve of the scalp behind the auricle is the posterior auricular branch of facial nerve.

\* The sensory nerves in front of the auricle belong to the trigeminal nerve, while those behind the auricle belong to the cervical nerves.

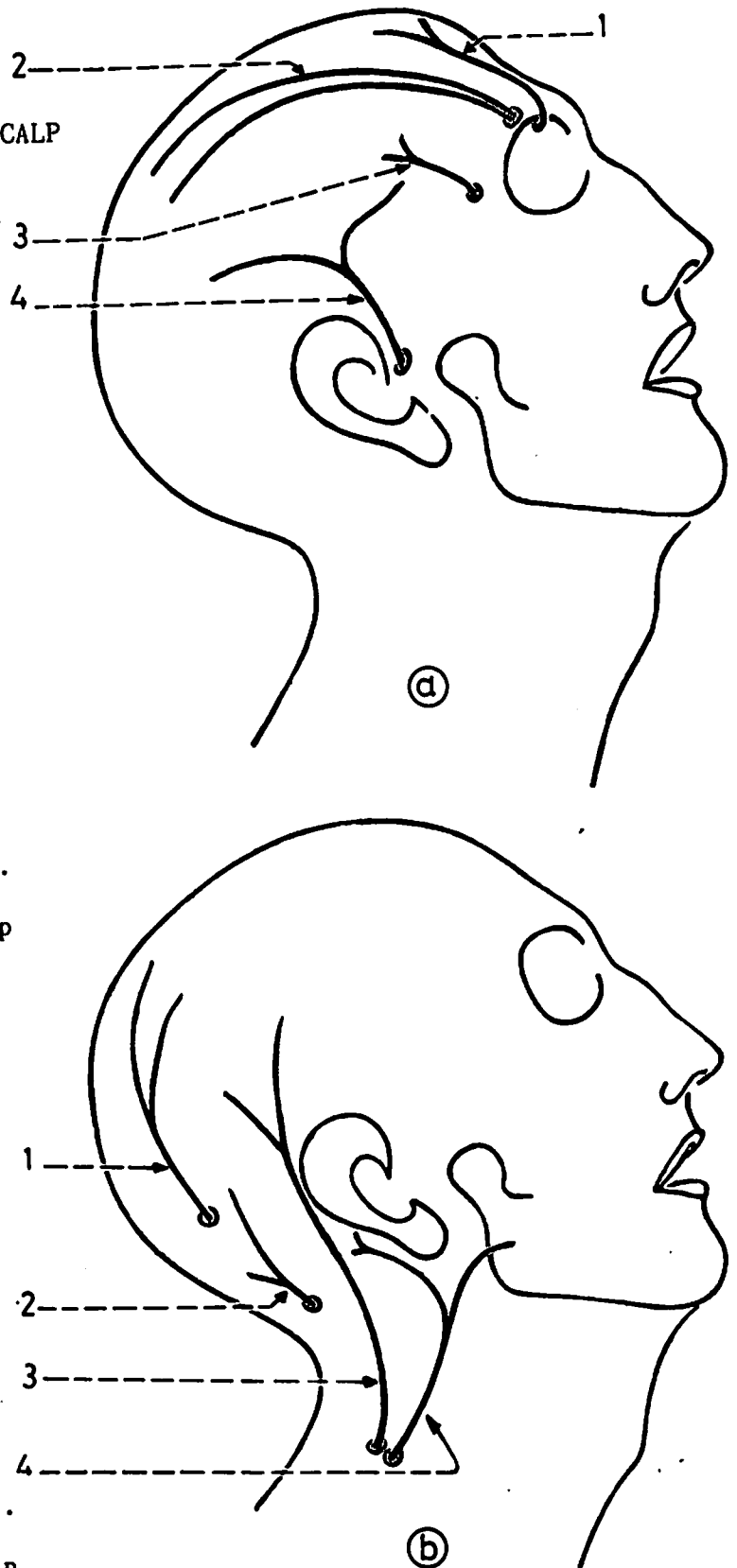




Fig.(112): ARTERIES OF THE SCALP

The scalp is supplied by 5 arteries on each side (3 in front of the auricle and 2 behind it).

1. supratrochlear artery.
2. supraorbital artery.
3. superficial temporal artery.
4. posterior auricular artery.
5. occipital artery.

\* The supratrochlear and supraorbital arteries belong to the internal carotid artery, while the other 3 branches belong to the external carotid artery. These arteries anastomose freely with each other.

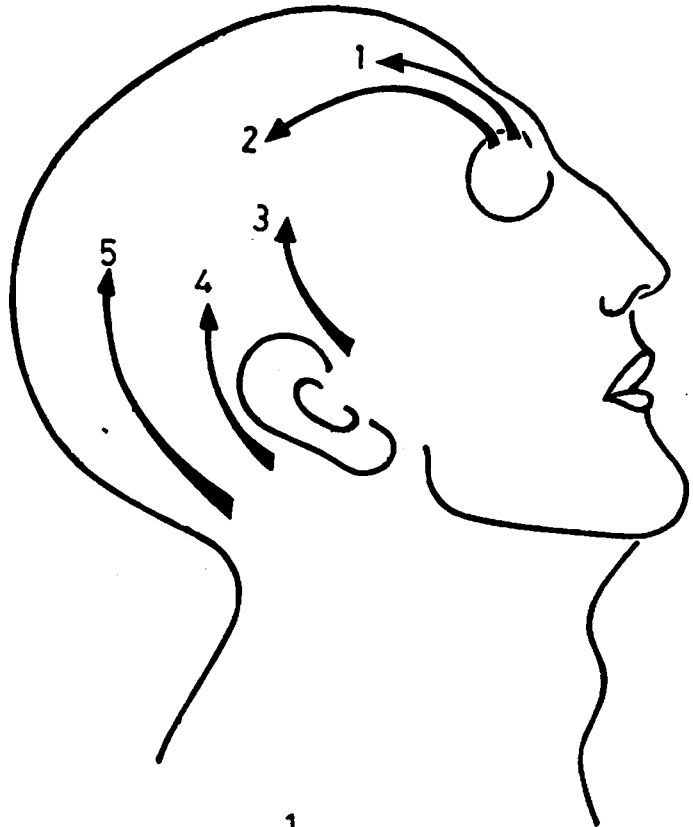
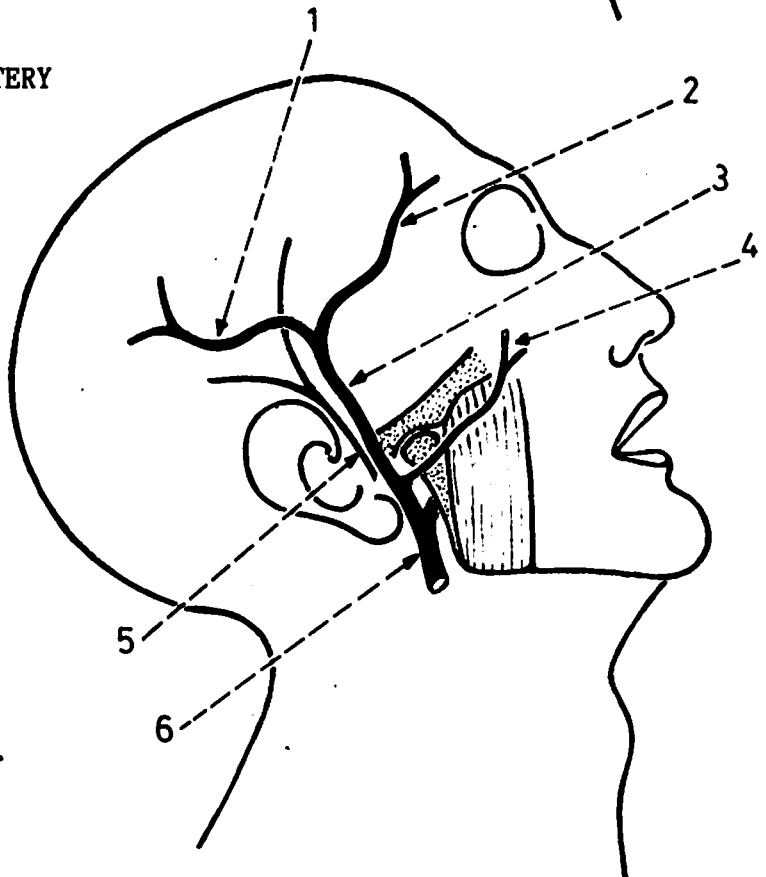


Fig.(113): SUPERFICIAL TEMPORAL ARTERY

It is one of the 2 terminal divisions of the external carotid artery. It crosses over the root of the zygomatic arch and ends by dividing into anterior and posterior branches.

1. posterior branch of superficial temporal artery.
2. anterior branch of superficial temporal artery.
3. superficial temporal artery.
4. transverse facial artery (a branch from the superficial temporal artery which runs forwards below the zygomatic arch).
5. auriculotemporal nerve (runs upwards behind the superficial temporal artery).
6. termination of the external carotid artery (behind the neck of the mandible).



\* The superficial temporal artery gives also the middle temporal branch just above the zygomatic arch.

Fig.(114): SUPRAORBITAL AND SUPRATROCHLEAR ARTERIES

These are 2 branches of the ophthalmic artery which arises from the internal carotid artery. They extend backwards in the scalp as far as the vertex of the skull, and are accompanied by the corresponding nerves.

1. supraorbital artery and nerve.
2. supratrochlear artery and nerve.

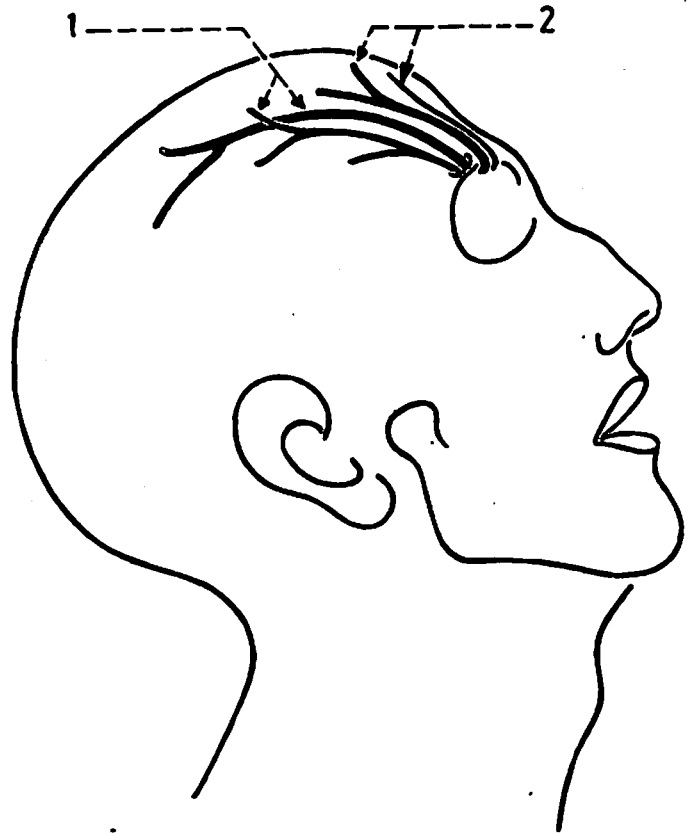


Fig.(115): OCCIPITAL AND POSTERIOR AURICULAR ARTERIES

These are branches from the external carotid artery which supply the back of the scalp. The posterior auricular artery runs superficial to the mastoid process while the occipital artery runs deep to it.

1. greater occipital nerve (accompanies the terminal part of the occipital artery).
2. occipital artery.
3. posterior auricular artery.
4. external carotid artery.

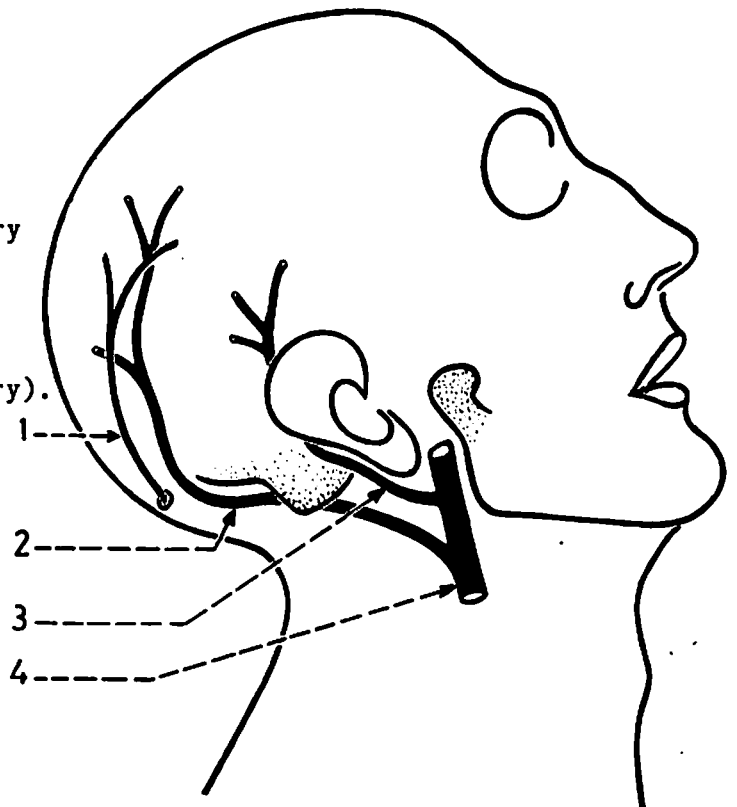


Fig.(116): VEINS OF THE SCALP

These are the supraorbital, supratrochlear, superficial temporal, posterior auricular and occipital (i.e. corresponding to the arteries).

1. external jugular vein (from union of posterior auricular vein and posterior division of the retromandibular vein).
2. retromandibular vein.
3. posterior auricular vein (behind the auricle).
4. superficial temporal vein.
5. superior ophthalmic vein (joins the facial vein).
6. supraorbital vein.
7. supratrochlear vein.
8. facial vein (formed by the union of the supra-orbital and supra-trochlear veins).
9. common facial vein.

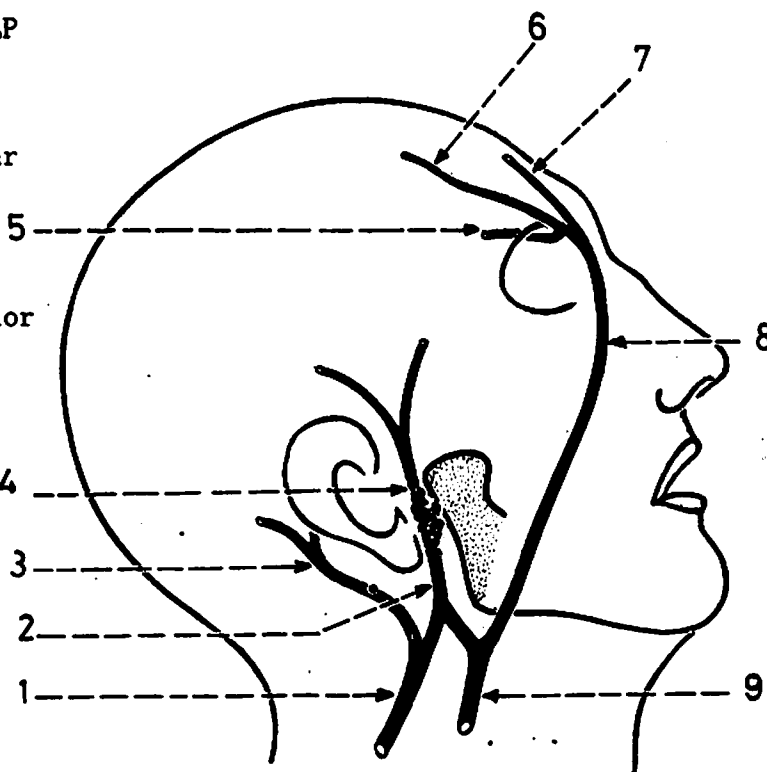
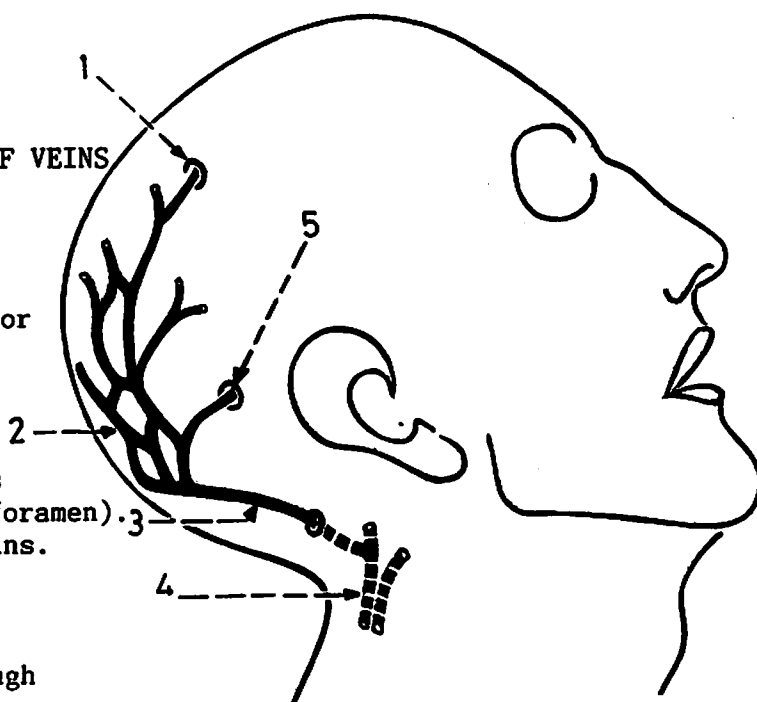


Fig.(117): OCCIPITAL PLEXUS OF VEINS

It lies on the back of the scalp and drains into the occipital vein. These veins are connected with the superior sagittal sinus and transverse sinus by emissary veins.

1. emissary vein to the superior sagittal sinus (through the parietal foramen).
2. occipital plexus of veins.
3. occipital vein.
4. vertebral veins.
5. emissary vein to the transverse sinus (through the mastoid foramen).

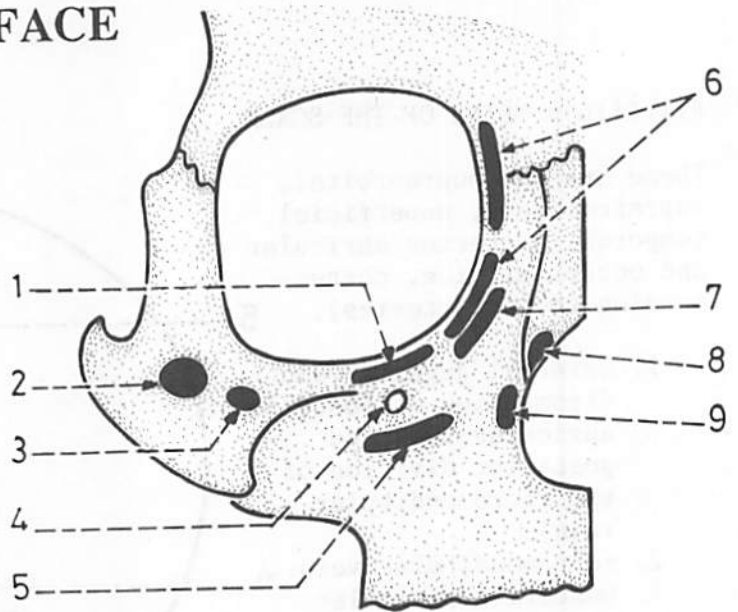


## FACE

MUSCLES OF THE FACE

Fig.(118): BONY ATTACHMENTS OF MUSCLES OF THE FACE

1. levator labii superioris.
2. zygomaticus major.
3. zygomaticus minor.
4. infraorbital foramen.
5. levator anguli oris.
6. orbicularis oculi.
7. levator labii superioris alaeque nasi.
8. procerus.
9. nasalis.



\* All these attachments are origins because the facial muscles are inserted into the skin of the face. They are called muscles of facial expression.

Fig.(119): ORBICULARIS OCULI

It consists of 3 parts: orbital part, palpebral part and lacrimal part.

1. temporal and zygomatic branches of facial nerve (supply the orbicularis oculi).
2. frontal belly of occipito-frontalis (blends with the orbicularis oculi).
3. orbital part of orbicularis oculi (surrounds the circumference of the orbit).
4. medial palpebral ligament.
5. palpebral part (in both lids).

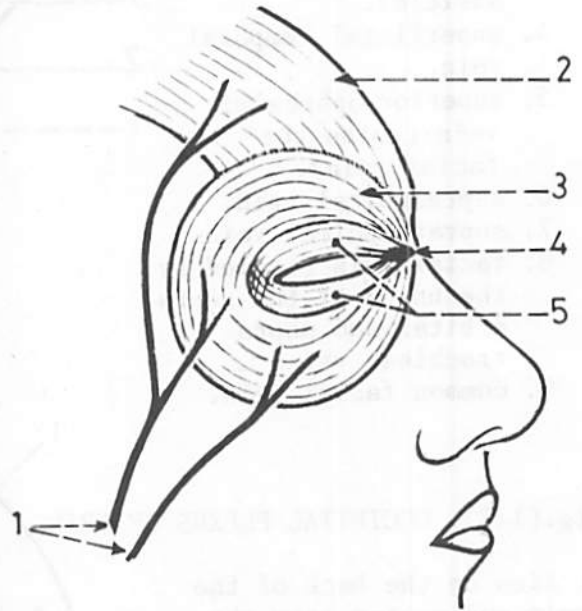


Fig.(120): POSITION OF THE PARTS OF THE ORBICULARIS OCULI

1. orbital part: around the circumference of the orbit.
2. palpebral part: in both lids.
3. lacrimal part: covers the lacrimal sac.

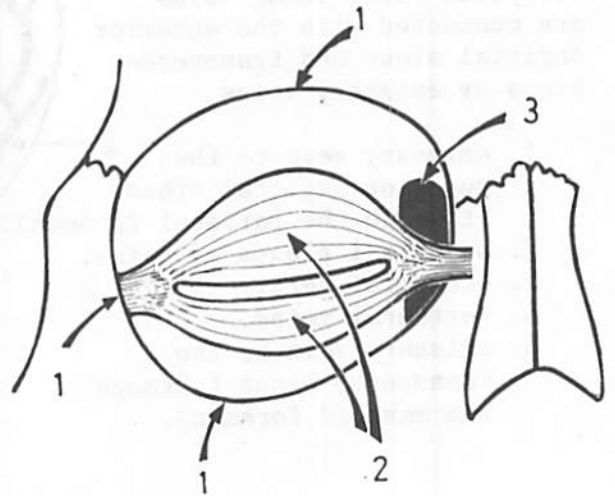


Fig.(121): PALPEBRAL PART OF ORBICULARIS OCULI

It lies in the upper and lower lids. Its fibres arise from the medial palpebral ligament medially, and interlace together at the lateral palpebral raphe laterally.

1. lateral palpebral raphe.
2. palpebral part in lower lid.
3. medial palpebral ligament.
4. palpebral part in upper lid.

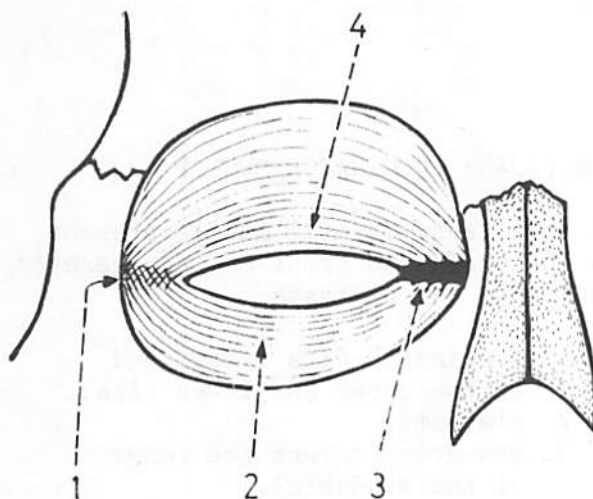


Fig.(122): LACRIMAL PART OF ORBICULARIS OCULI

It arises from the lacrimal fascia covering the lacrimal sac and from the lacrimal crest just behind the sac. Its fibres pass laterally into the upper and lower lids.

1. upper lid.
2. fibres of lacrimal part of orbicularis oculi.
3. lacrimal sac surrounded by lacrimal fascia.
4. lower lid.

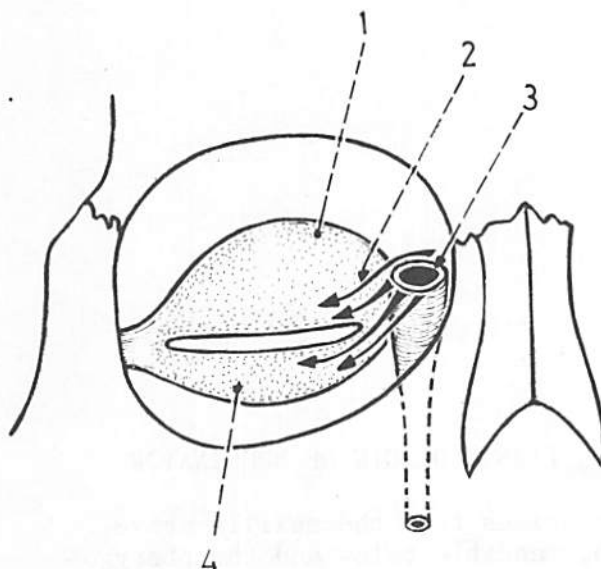


Fig.(123): MEDIAL AND LATERAL PALPEBRAL LIGAMENTS

The medial palpebral ligament connects the medial ends of the 2 tarsi of both lids to the medial margin of the orbit, while the lateral palpebral ligament connects the 2 tarsi to the lateral margin of the orbit. The lateral palpebral raphe lies superficial to the lateral palpebral ligament.

1. superior tarsus.
2. lacrimal sac.
3. lateral palpebral ligament.
4. palpebral fissure.
5. inferior tarsus.
6. medial palpebral ligament (in front of the lacrimal sac).

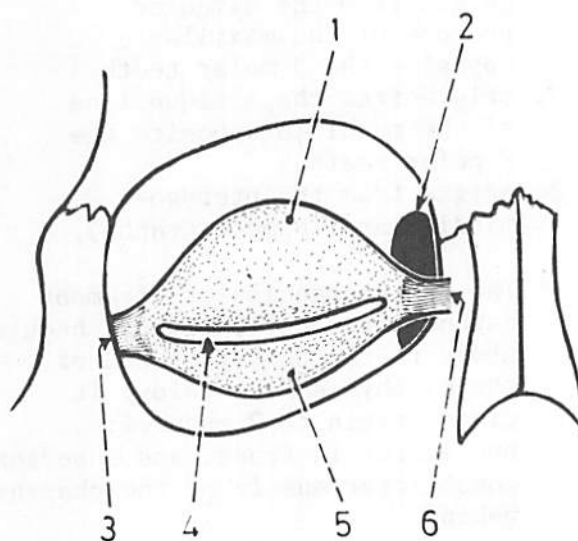


Fig.(124): BUCCINATOR MUSCLE

It is a quadrilateral muscle present in the cheek, in front of the masseter and above the platysma.

1. buccinator (its fibres end in the upper and lower lips).
2. platysma.
3. masseter (covers the ramus of the mandible).

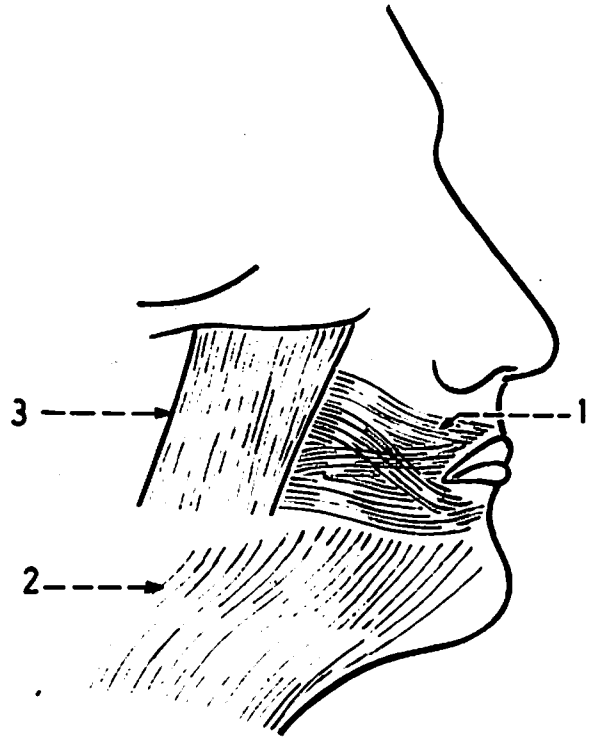


Fig.(125): ORIGIN OF BUCCINATOR

It arises from the maxilla above, the mandible below and the pterygo-mandibular ligament behind.

1. origin from the alveolar process of the maxilla opposite the 3 molar teeth.
2. origin from the oblique line of the mandible opposite the 3 molar teeth.
3. origin from the pterygo-mandibular ligament (raphe).

\* The pterygomandibular ligament extends from the pterygoid hamulus above to the posterior end of the mylohyoid line below. It gives origin to 2 muscles: buccinator in front, and superior constrictor muscle of the pharynx behind.

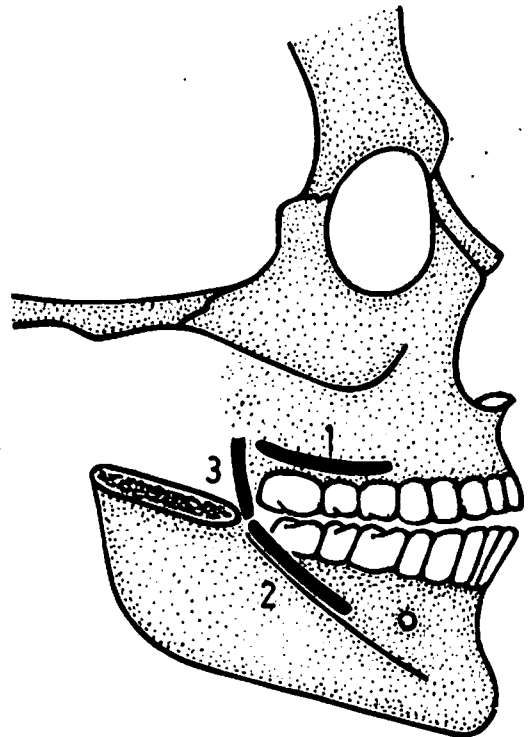


Fig.(126): INSERTION OF BUCCINATOR

The fibres converge on the angle of the mouth to get inserted into the upper and lower lips. The upper fibres enter the upper lip, the lower fibres enter the lower lip while the middle fibres decussate at the angle of the mouth.

1. upper fibres (to upper lip).
2. middle fibres decussating at the angle of the mouth.
3. lower fibres (to lower lip).

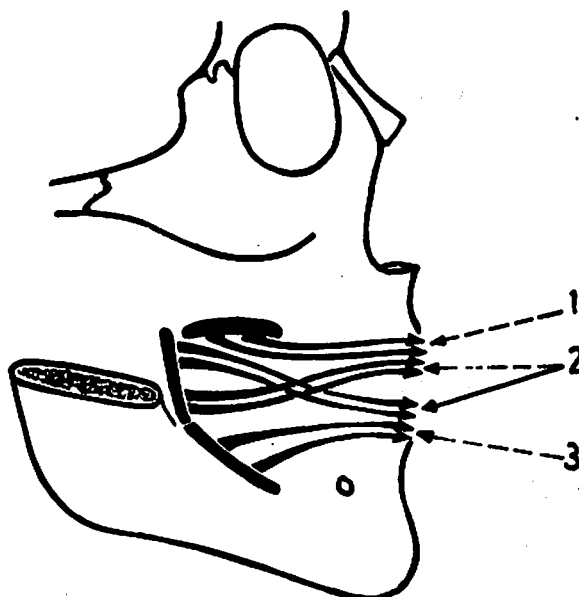


Fig.(127): SUPERFICIAL RELATIONS OF BUCCINATOR MUSCLE

1. buccal branches of facial nerve.
2. facial artery.
3. buccinator muscle.

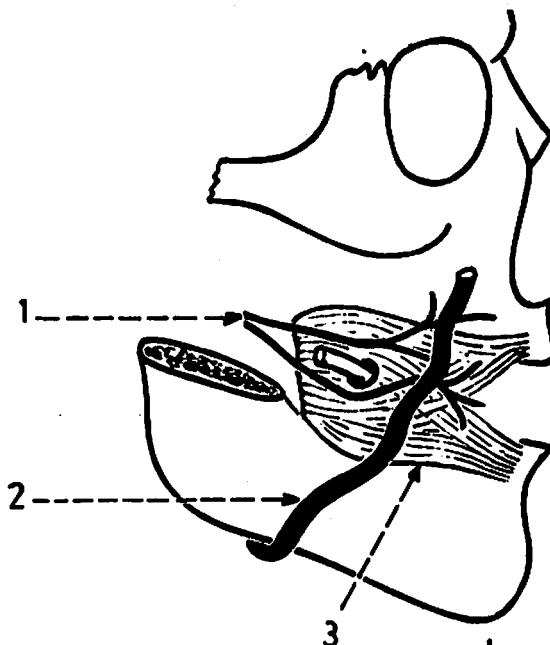
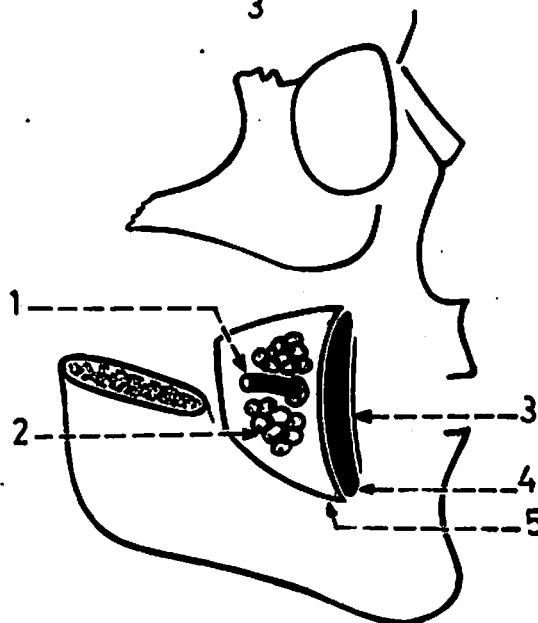


Fig.(128): OTHER RELATIONS OF BUCCINATOR MUSCLE

The muscle is covered by the buccopharyngeal fascia and the buccal pad of fat. It is lined by the mucous membrane of the mouth and is pierced by the parotid duct.

1. parotid duct.
2. buccal pad of fat.
3. mucous membrane of the vestibule of the mouth.
4. buccinator.
5. buccopharyngeal fascia.



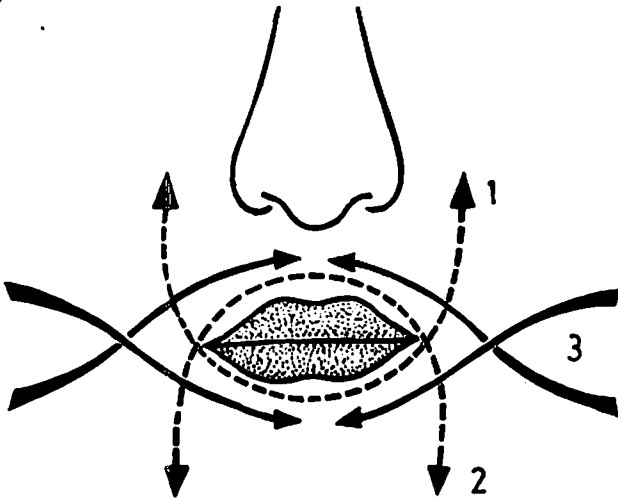


Fig.(129): MUSCLES ACTING ON THE ANGLE OF THE MOUTH

1. levator anguli oris.
2. depressor anguli oris.
3. decussating fibres of buccinator.

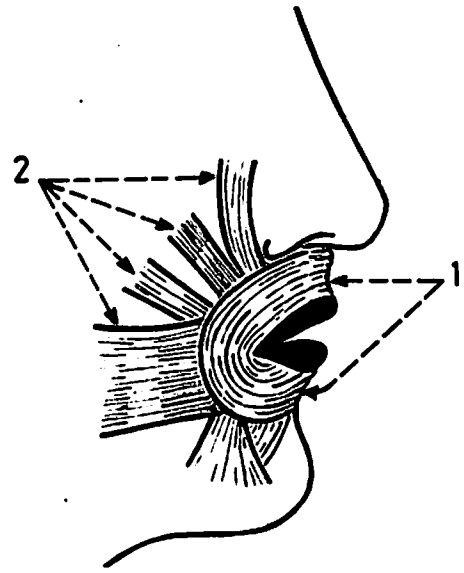


Fig.(130): ORBICULARIS ORIS MUSCLE

It surrounds the mouth and consists of 2 parts: intrinsic and extrinsic .

1. intrinsic part.
2. extrinsic part.

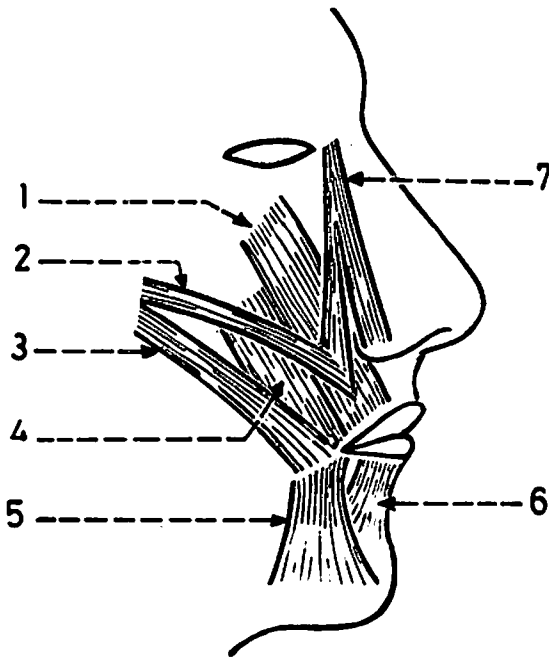


Fig.(131): MUSCLES OF THE MOUTH

1. levator labii superioris.
2. zygomaticus minor.
3. zygomaticus major.
4. levator anguli oris.
5. depressor anguli oris.
6. depressor labii inferioris.
7. levator labii superioris alaeque nasi.

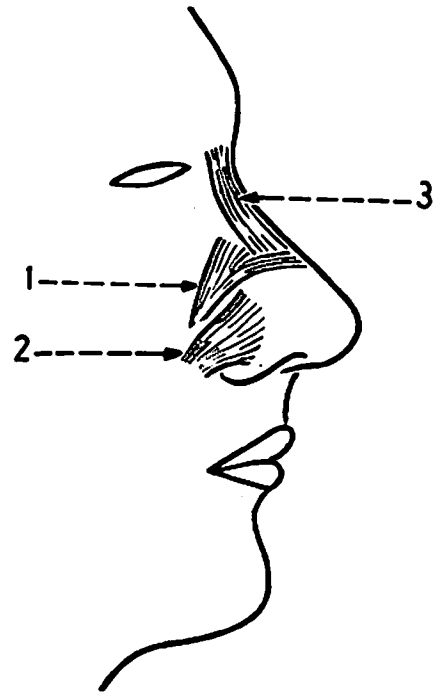


Fig.(132): MUSCLES OF THE NOSE

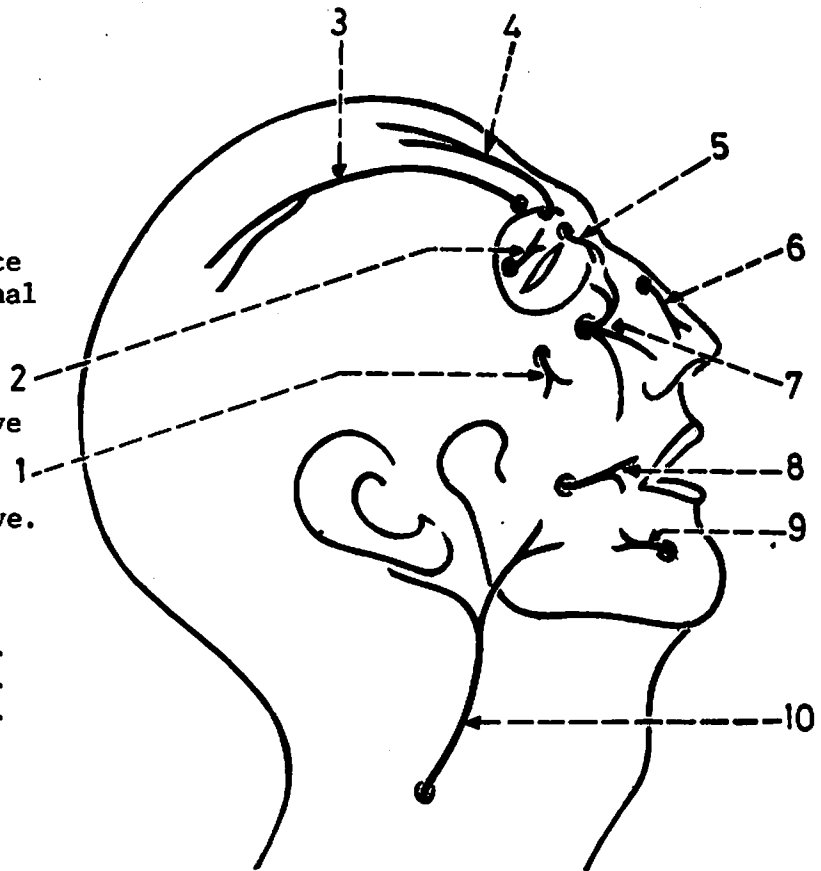
1. compressor naris.
2. dilator naris.
3. procerus.



## NERVES OF THE FACE

Fig.(133): SENSORY NERVES  
OF THE FACE

Most of the skin of the face is supplied by the trigeminal nerve (5th cranial). In addition, the skin over the parotid gland is supplied by the great auricular nerve (cervical 2,3).

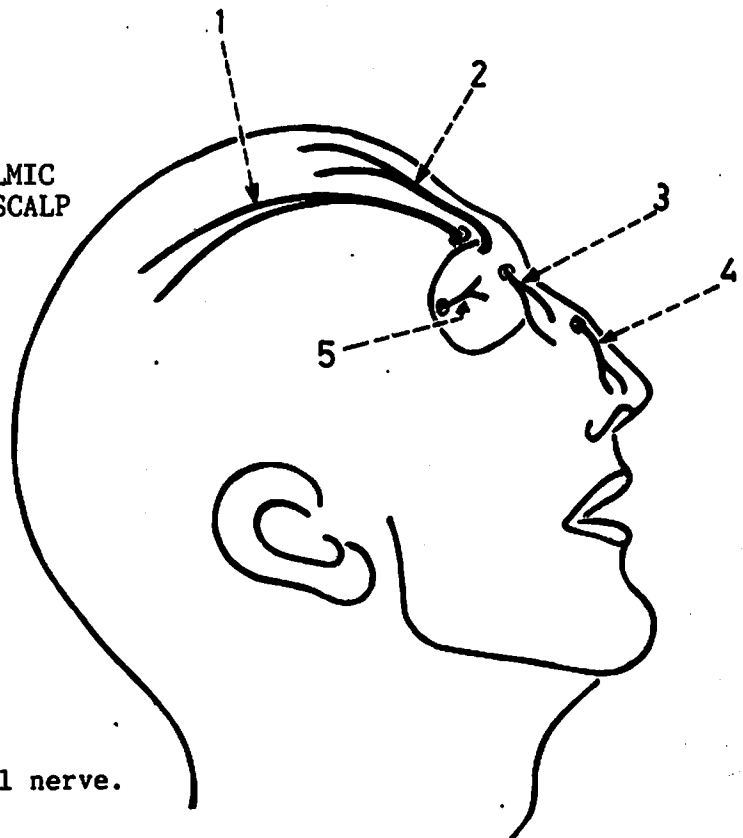


1. zygomaticofacial nerve.
2. palpebral branch of lacrimal nerve.
3. supraorbital nerve.
4. supratrochlear nerve.
5. infratrochlear nerve.
6. external nasal nerve.
7. termination of the infraorbital nerve.
8. buccal branch of mandibular nerve.
9. mental nerve.
10. great auricular nerve.

\* The sensory nerves to the face are branches of the 3 divisions of the trigeminal nerve: ophthalmic, maxillary and mandibular.

Fig.(134): BRANCHES OF THE OPHTHALMIC  
NERVE TO THE FACE AND SCALP

The ophthalmic nerve lies in the orbit and divides into 3 branches: frontal, nasociliary and lacrimal. These 3 branches give off cutaneous branches to the upper part of the face.



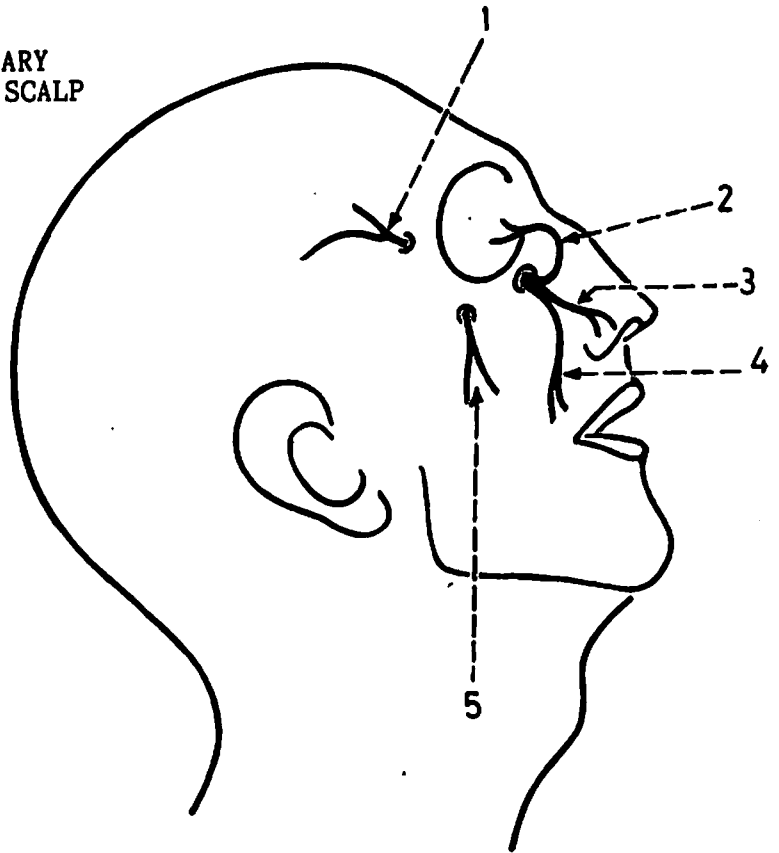
1. supraorbital nerve (from the frontal nerve).
2. supratrochlear nerve (from the frontal nerve).
3. infratrochlear nerve (from the nasociliary nerve).
4. external nasal nerve (from the nasociliary nerve).
5. palpebral branch of lacrimal nerve.

**Fig.(135): BRANCHES OF THE MAXILLARY NERVE TO THE FACE AND SCALP**

The maxillary nerve gives off cutaneous branches to the middle part of the face. These are the nasal, labial and palpebral branches of the infra-orbital nerve as well as the zygomaticofacial nerve. It also gives off the zygomaticotemporal nerve to the skin of the scalp.

1. zygomaticotemporal nerve (to the scalp).
2. palpebral branch of the infraorbital nerve (to the lower eyelid).
3. nasal branch of the infra-orbital nerve (to the side of the nose).
4. labial branch of infra-orbital nerve (to the upper lip).
5. zygomaticofacial nerve (to the skin over the zygomatic bone).

\* The skin of the lower lid is supplied by the maxillary nerve, while the skin of the upper lid is supplied by the ophthalmic nerve.



**Fig.(136): BRANCHES OF THE MANDIBULAR NERVE TO THE FACE AND SCALP**

These are the buccal, mental and auriculotemporal.

1. auriculotemporal nerve (to the scalp).
2. buccal nerve (to the skin of the cheek).
3. mental nerve (to the skin of lower lip and chin).
4. area supplied by the great auricular nerve.

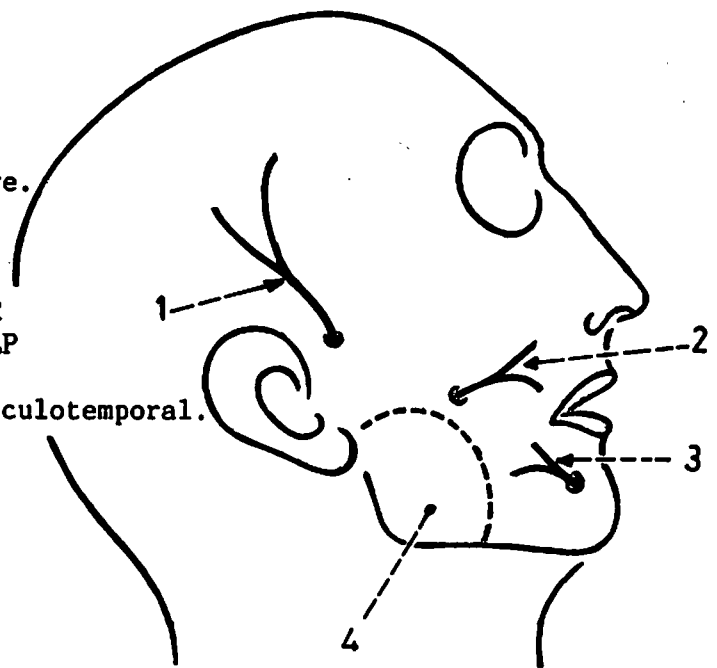


Fig.(137): CUTANEOUS DISTRIBUTION OF THE TRIGEMINAL AND CERVICAL NERVES

The trigeminal nerve supplies the skin of the scalp in front of a line extending from the vertex to the auricle, and the skin of the face except the part covering the parotid gland. The rest of the skin of the scalp and face is supplied by cervical nerves.

1. area supplied by ophthalmic nerve.
2. area supplied by maxillary nerve.
3. area supplied by mandibular nerve.
4. area of the face supplied by cervical nerves.
5. area of the scalp supplied by cervical nerves.

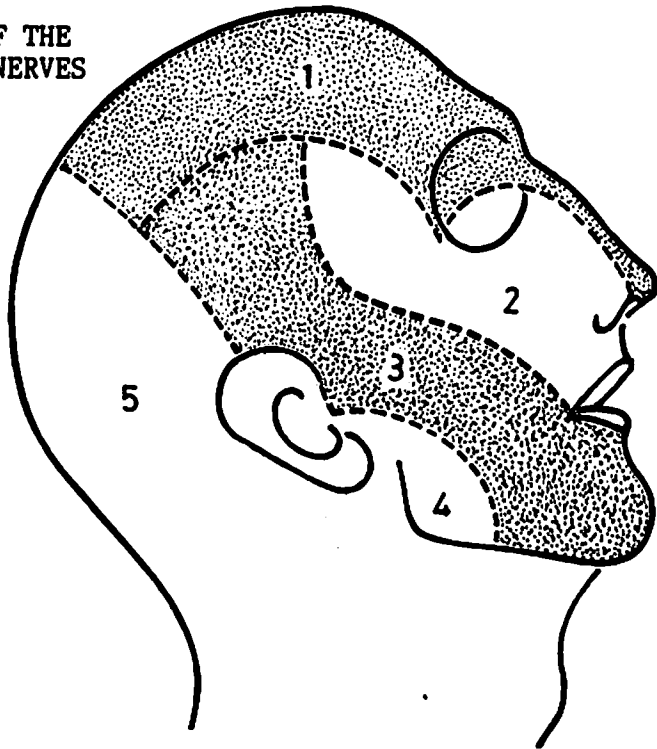
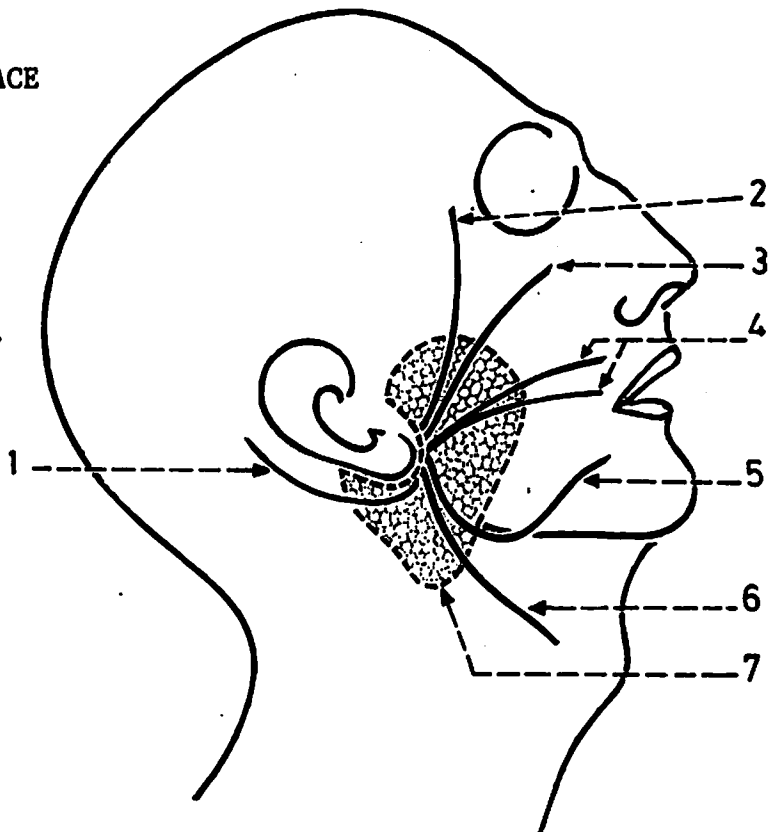


Fig.(138): MOTOR NERVES OF THE FACE

These are branches of the facial nerve which traverse the parotid gland and appear in the face and scalp to supply their muscles.

1. posterior auricular branch.
2. temporal branch.
3. zygomatic branch.
4. buccal branches.
5. mandibular branch.
6. cervical branch.
7. parotid gland.



VESSELS OF THE FACE

Fig.(139): ARTERIES OF THE FACE

The main arteries of the face are the facial, transverse facial, supraorbital and supratrochlear. In addition, the terminations of the infraorbital, mental and dorsal nasal arteries share in the supply of the face.

1. superficial temporal artery.
2. transverse facial artery (just below and parallel to the zygomatic arch).
3. supraorbital artery (from the ophthalmic).
4. supratrochlear artery (from the ophthalmic).
5. dorsal nasal artery (from the ophthalmic).
6. facial artery (from the external carotid).
7. mental artery (from the inferior alveolar).
8. infraorbital artery (from the maxillary).

\* All these branches belong to the external carotid except the supraorbital, supratrochlear and dorsal nasal which belong to the internal carotid.

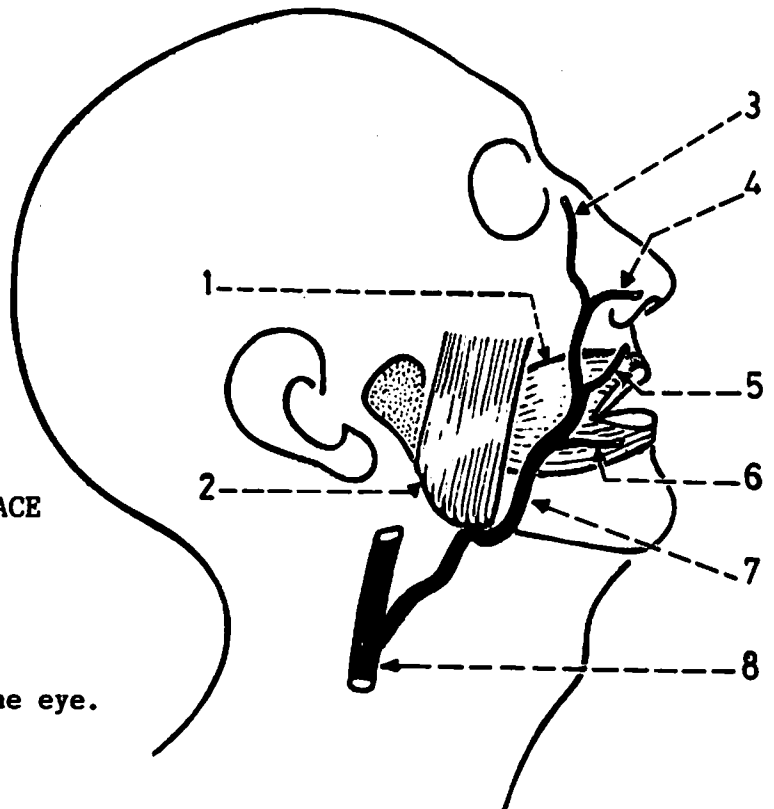
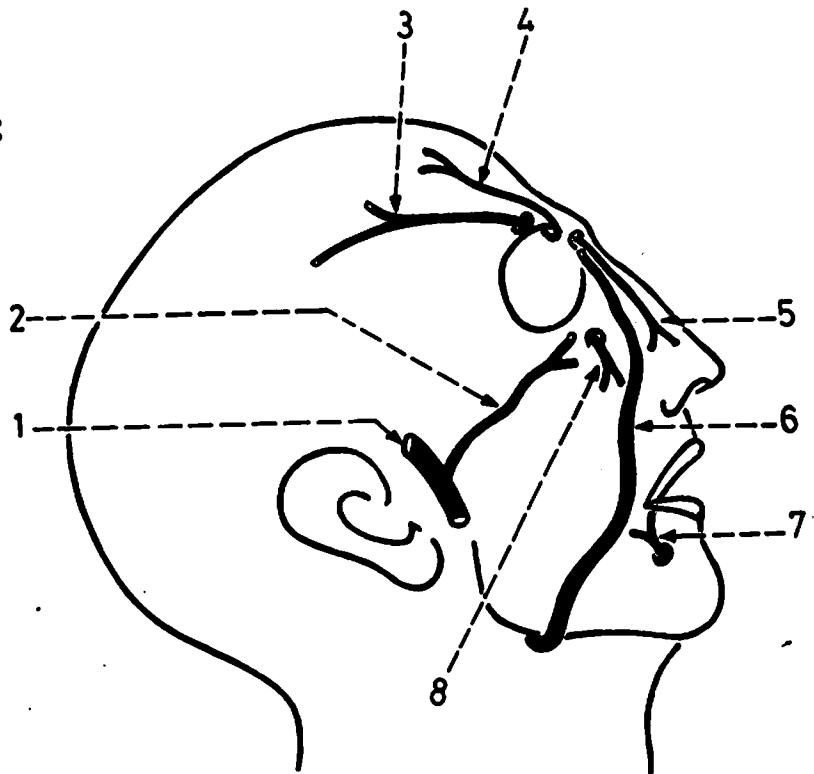


Fig.(140): FACIAL ARTERY IN THE FACE

It is a branch of the external carotid. It runs close to the antero-inferior angle of the masseter, angle of the mouth and ends at the medial angle of the eye.

1. buccinator muscle.
2. masseter muscle.
3. angular artery (termination of facial artery).
4. lateral nasal branch.
5. superior labial branch.
6. inferior labial branch.
7. facial artery (wavy course).
8. external carotid artery.

Fig.(141): VEINS OF THE FACE

The face is drained by 2 main veins: facial vein anteriorly, and retromandibular vein posteriorly.

(a) Facial vein:

It is formed by the union of the supraorbital and supratrochlear veins and runs downwards and backwards just behind the facial artery. It ends by joining the anterior division of the retromandibular vein to form the common facial vein.

1. supraorbital vein.
2. superior ophthalmic vein.
3. inferior ophthalmic vein.
4. deep facial vein.
5. anterior division of retromandibular vein.
6. supratrochlear vein.
7. beginning of facial vein.
8. termination of facial artery.
9. facial artery.
10. common facial vein.

\* In contrast to the facial artery, the facial vein has a straight course.

(b) Retromandibular vein:

It lies within the parotid gland and is formed by union of the maxillary and superficial temporal veins behind the neck of the mandible. It ends by dividing into anterior and posterior divisions.

1. posterior auricular vein.
2. external jugular vein.
3. superficial temporal vein.
4. maxillary vein.
5. retromandibular vein.
6. anterior division of retromandibular vein.
7. posterior division of retromandibular vein.

\* Note that the venous blood from the face finally reaches the internal and external jugular veins.

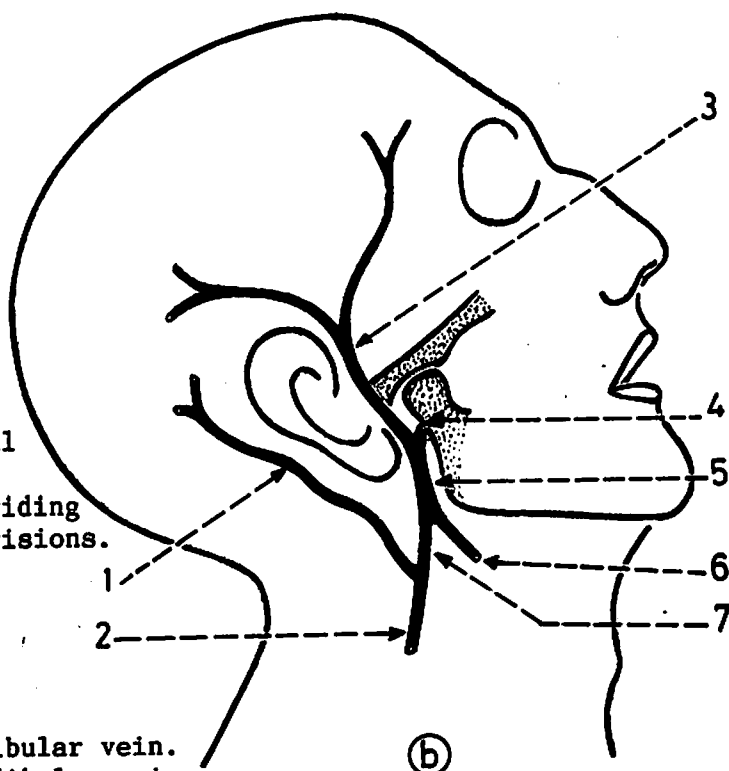
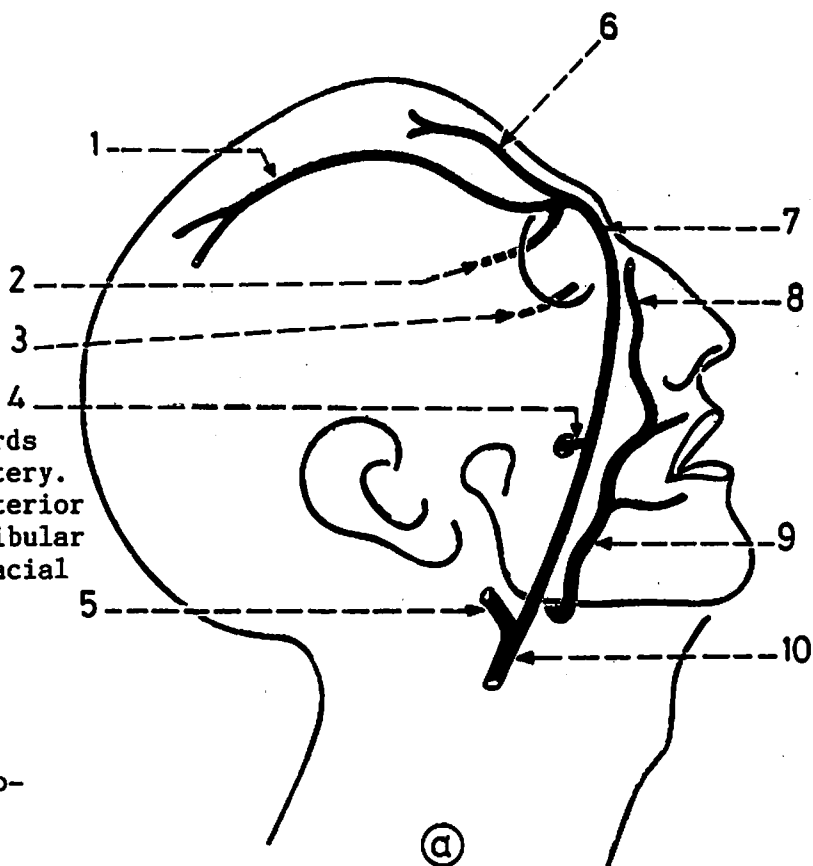
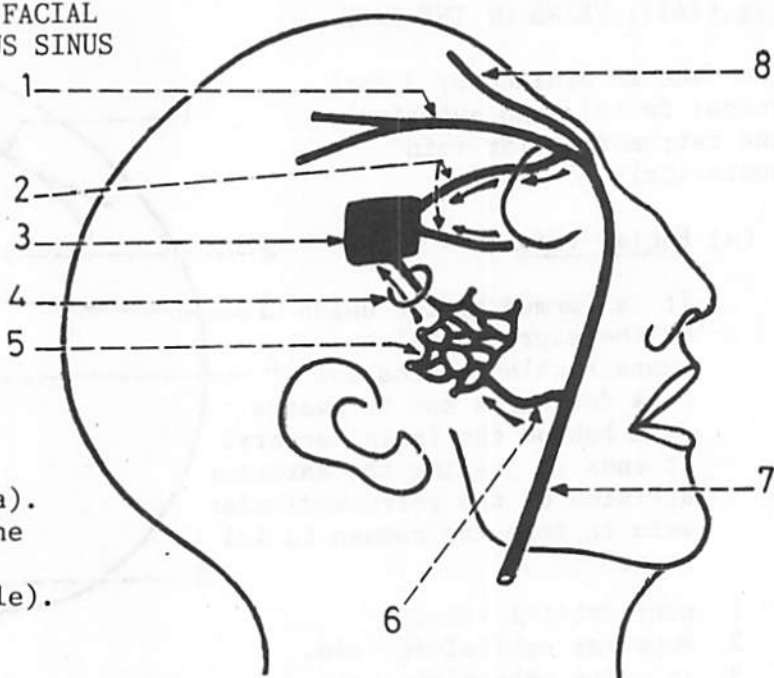


Fig.(142): COMMUNICATIONS OF THE FACIAL VEIN WITH THE CAVERNOUS SINUS

The facial vein communicates with the cavernous sinus through 2 routes: the ophthalmic and deep facial veins.

1. supraorbital vein.
2. superior and inferior ophthalmic veins.
3. cavernous sinus.
4. foramen ovale transmitting an emissary vein.
5. pterygoid plexus of veins (in the infratemporal fossa).
6. deep facial vein (enters the infratemporal fossa deep to the ramus of the mandible).
7. facial vein.
8. supratrochlear vein.



\* The superior ophthalmic vein lies in the orbit and connects the beginning of the facial vein with the cavernous sinus.

\* The deep facial vein joins the middle of the facial vein with the pterygoid plexus of veins. This plexus communicates with the cavernous sinus through an emissary vein that passes through the foramen ovale.

Fig.(143): DANGEROUS AREA OF THE FACE

It is the area around the nose and upper lip. It is dangerous because of the connection of the facial vein with the cavernous sinus and the possibility of spread of infection from the face to the sinus.

\* Note that the dangerous area of the scalp is the subaponeurotic space where infection can reach the dural sinuses through the emissary veins traversing the space.

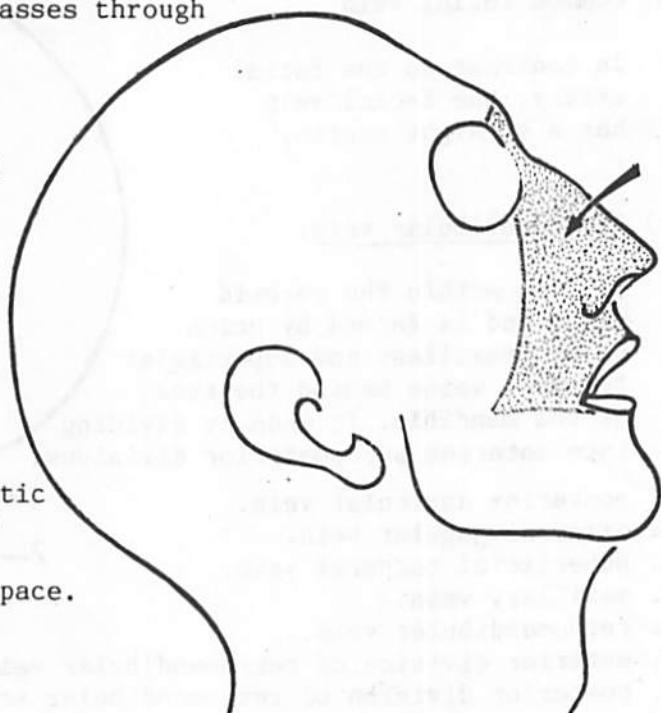
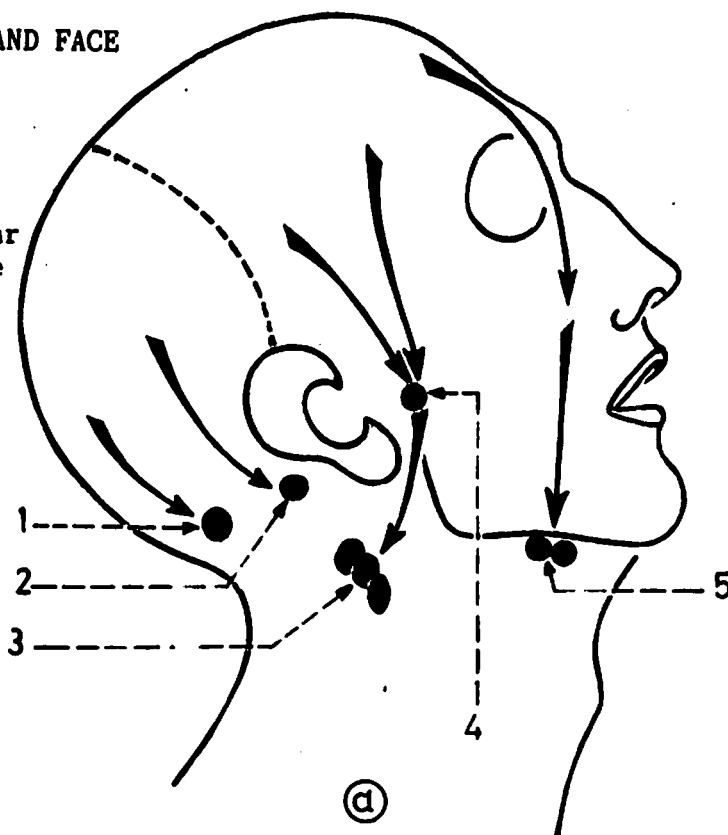


Fig.(144): LYMPH DRAINAGE OF SCALP AND FACE

(a) Scalp:

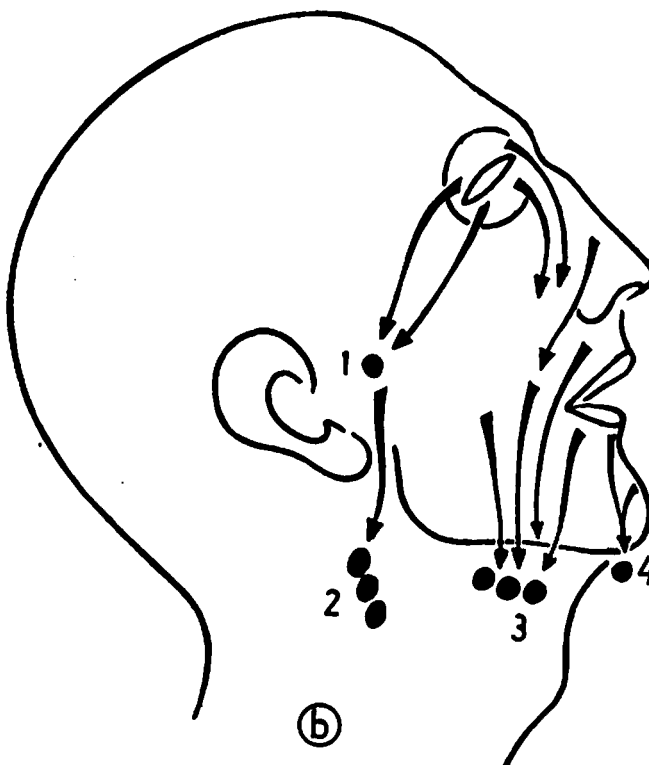
The part of the scalp in front of the auricle drains into the parotid, submandibular and deep cervical nodes, while the part of the scalp behind the auricle drains into the mastoid and occipital nodes.

1. occipital node.
2. mastoid node (on the mastoid process).
3. deep cervical nodes.
4. parotid node.
5. submandibular nodes.

(b) Face:

The face drains into the submental, submandibular and deep cervical lymph nodes.

1. parotid node.
2. deep cervical nodes.
3. submandibular nodes.
4. submental node.



## PAROTID GLAND

Fig.(145): SALIVARY GLANDS

There are 3 salivary glands:  
parotid (largest), submandibular  
and sublingual (smallest).

1. parotid gland: related to the ear.
2. submandibular gland: just below the mandible and deep to it.
3. sublingual gland: below the tongue.

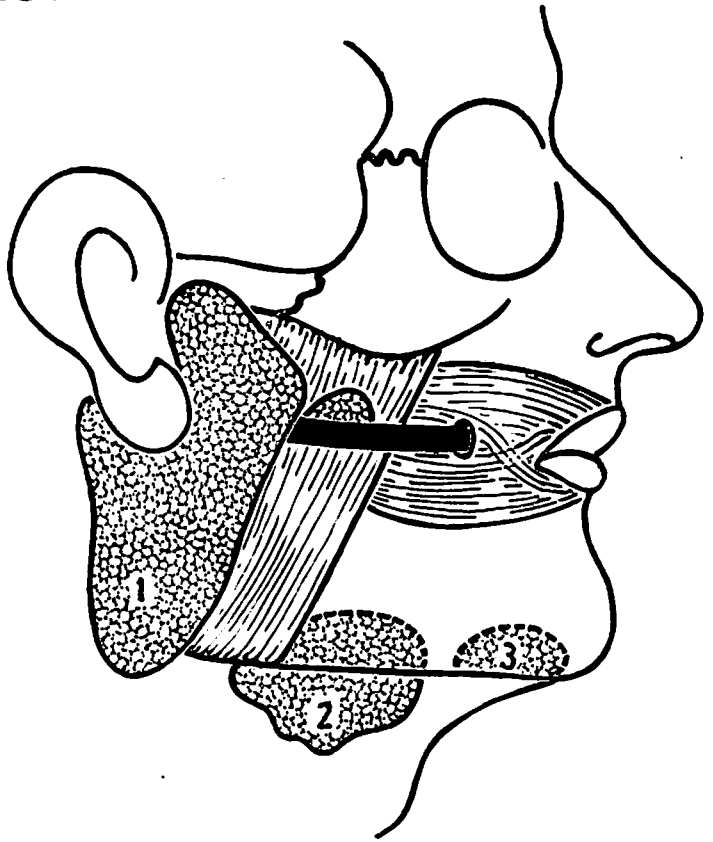


Fig.(146): BONES RELATED TO THE PAROTID GLAND

These are the ramus of the mandible, styloid process, mastoid process, external auditory meatus and posterior part of zygomatic arch.

1. ramus of the mandible.
2. styloid process.
3. mastoid process.
4. external auditory (acoustic) meatus.
5. zygomatic arch.

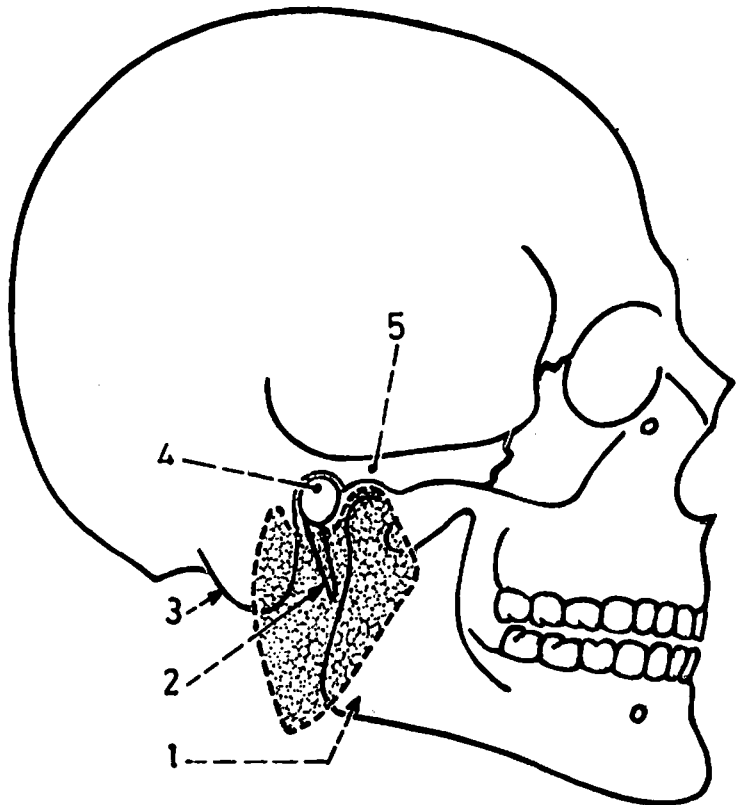




Fig.(147): ENDS AND BORDERS OF THE PAROTID GLAND

The gland has 2 ends (upper and lower) and 2 borders (anterior and posterior).

1. lower end (lies behind and below the angle of the mandible and forms the apex of the gland).
2. posterior border.
3. upper end (concave upwards to receive the external acoustic meatus).
4. accessory part of the parotid gland (a small partially detached part just above the parotid duct).
5. parotid duct.
6. anterior border of the gland.
7. masseter muscle.

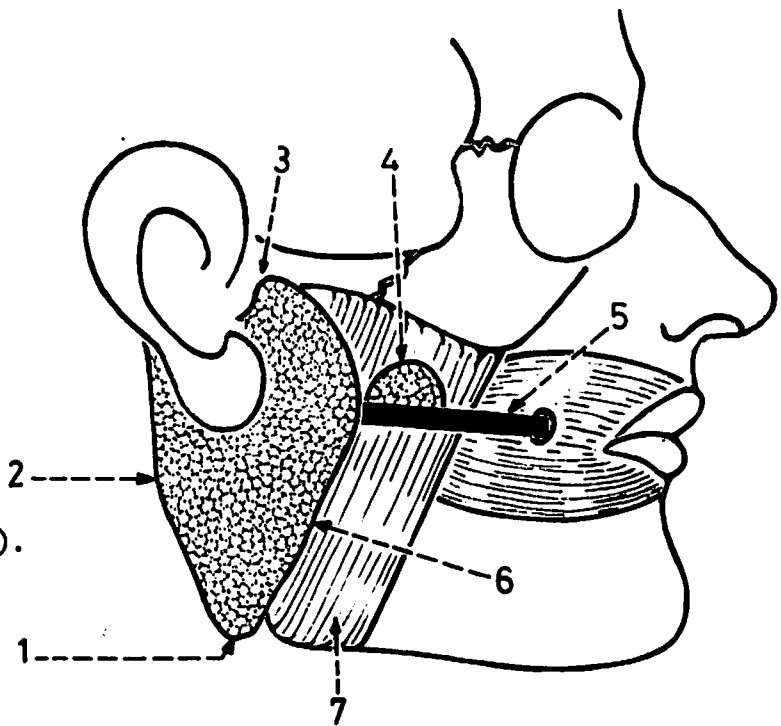


Fig.(148): SURFACES OF THE PAROTID GLAND (horizontal section)

The parotid gland is wedged between the ramus of the mandible (in front) 3 and the mastoid process (behind) 2. Its deep part reaches the styloid process. It has 3 surfaces: superficial, antero-medial and postero-medial.

1. superficial surface (related to the skin and fascia).
2. mastoid process.
3. postero-medial surface.
4. styloid process.
5. deep part of the gland.
6. antero-medial surface.
7. ramus of the mandible.

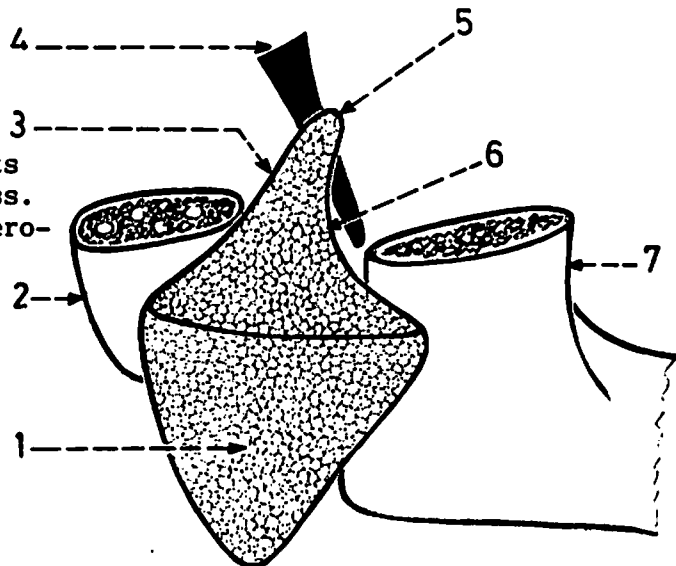


Fig.(149): PAROTID FASCIA

It forms the capsule of the parotid gland. It is an upward extension of the deep cervical fascia. Its deep part extending from the styloid process to the angle of the mandible is thickened to form the stylomandibular ligament.

1. styloid process.
2. parotid fascia.
3. mastoid process.
4. stylomandibular ligament.
5. angle of the mandible.

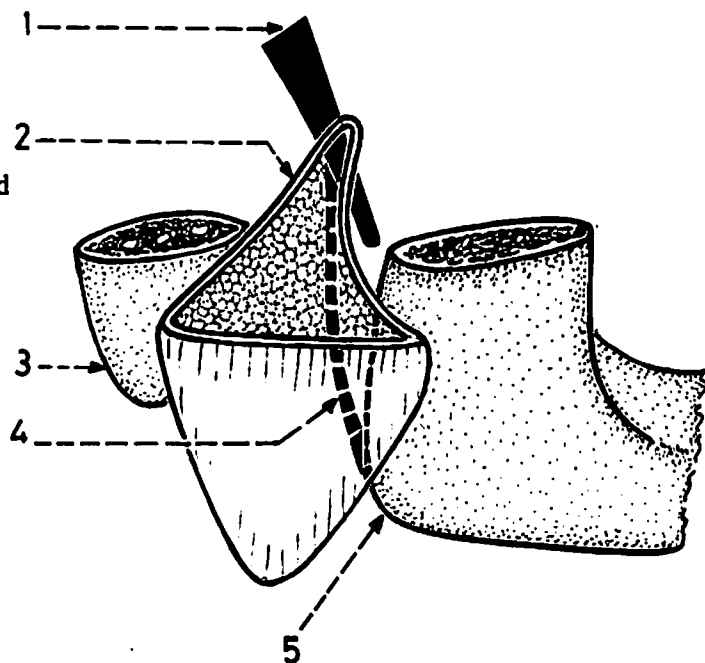


Fig.(150): STYLOMANDIBULAR LIGAMENT

It is the thickened medial part of the parotid fascia which extends from the styloid process to the angle of the mandible. It separates the parotid gland from the submandibular gland.

1. styloid process.
2. stylomandibular ligament.
3. mastoid process.
4. parotid gland (cut to show the ligament).
5. submandibular gland.

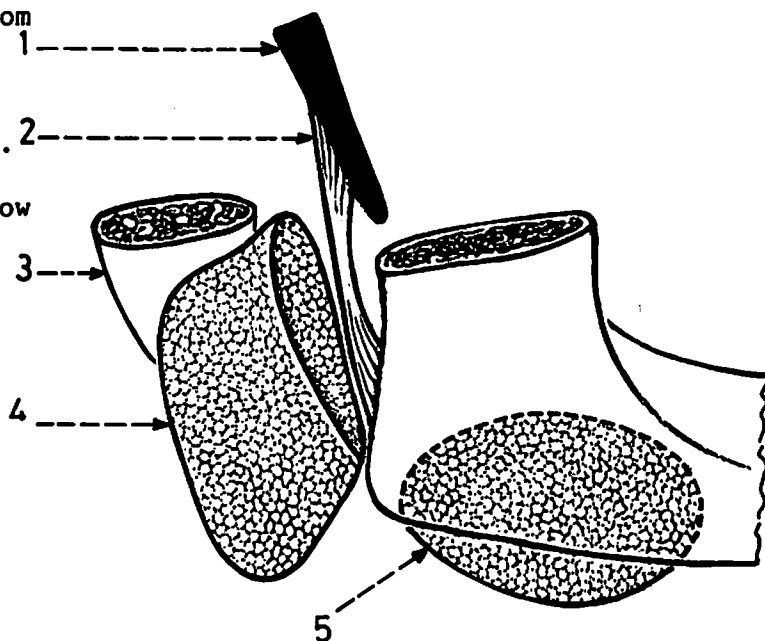


Fig.(151):RELATIONS OF UPPER AND LOWER ENDS OF THE PAROTID GLAND

The upper end is related to the superficial temporal vessels and auriculo-temporal nerve, while the lower end is related to the divisions of the retromandibular vein and cervical branch of facial nerve.

1. cervical branch of facial nerve.
2. anterior division of retromandibular vein.
3. posterior division of retromandibular vein.
4. auriculotemporal nerve.
5. superficial temporal vein.
6. superficial temporal artery.

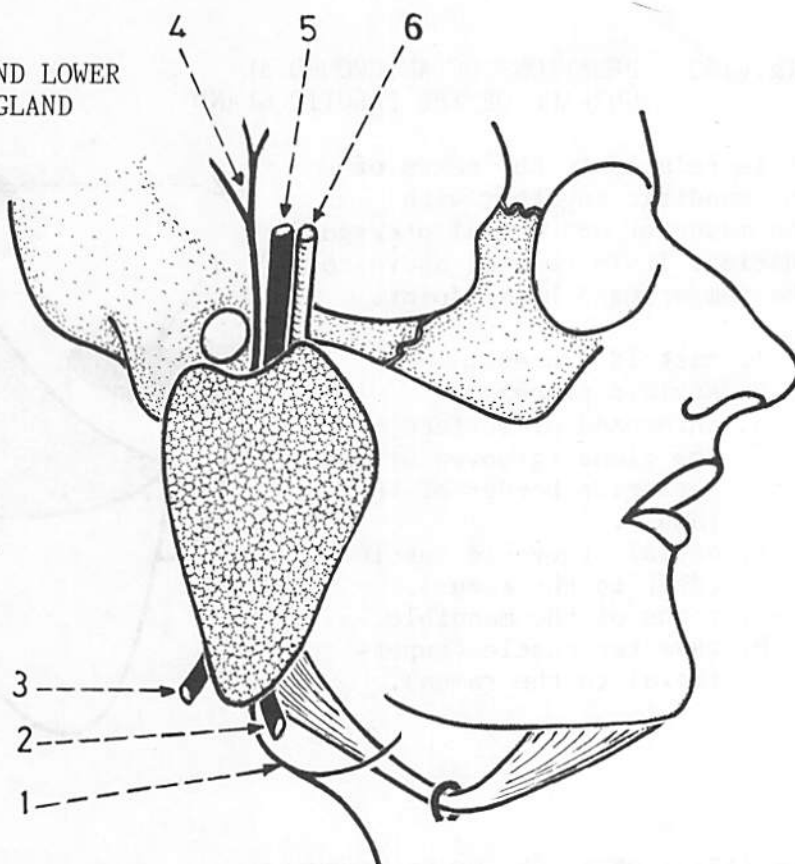
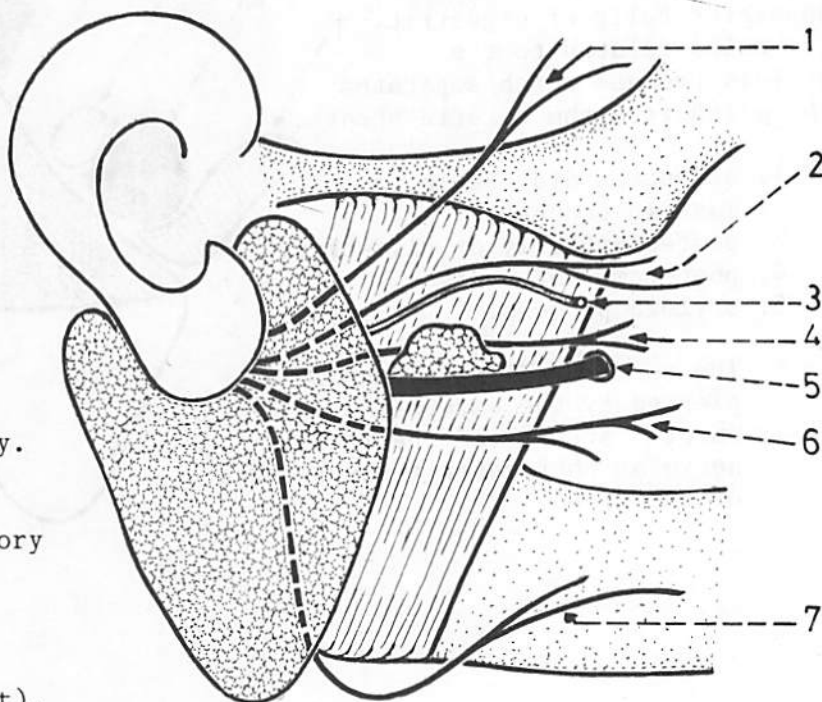


Fig.(152):RELATIONS OF THE ANTERIOR BORDER OF THE PAROTID GLAND

These are the parotid duct, accessory parotid gland, transverse facial artery and branches from the facial nerve to the muscles of the face.

1. temporal branch of facial nerve (the highest).
2. zygomatic branch of facial nerve (just below the zygomatic arch).
3. transverse facial artery.
4. buccal branch of facial nerve.
5. parotid duct and accessory part of parotid gland.
6. another buccal branch of facial nerve.
7. mandibular branch of facial nerve (the lowest).



\* The buccal branches are closely related to the parotid duct.

Fig.(153): RELATIONS OF ANTEROMEDIAL SURFACE OF THE PAROTID GLAND

It is related to the ramus of the mandible together with the masseter and medial pterygoid muscles. It is related above to the temporomandibular joint.

1. mastoid process.
2. styloid process.
3. anteromedial surface of the gland (grooved by the posterior border of the ramus).
4. medial pterygoid muscle (deep to the ramus).
5. ramus of the mandible.
6. masseter muscle (superficial to the ramus).

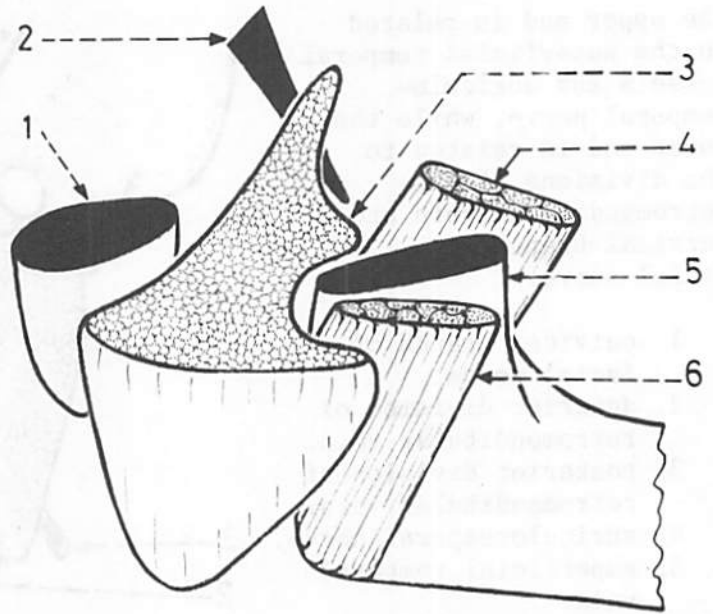


Fig.(154): RELATIONS OF POSTEROMEDIAL SURFACE OF THE PAROTID GLAND

It is related to the mastoid process together with the sternomastoid muscle and posterior belly of digastric. It is also related to the styloid process which separates the gland from the carotid sheath.

1. sternomastoid muscle.
2. mastoid process.
3. posterior belly of digastric.
4. posteromedial surface.
5. styloid process.

\* The posteromedial surface is pierced by the external carotid artery and the facial nerve as they enter the substance of the gland.

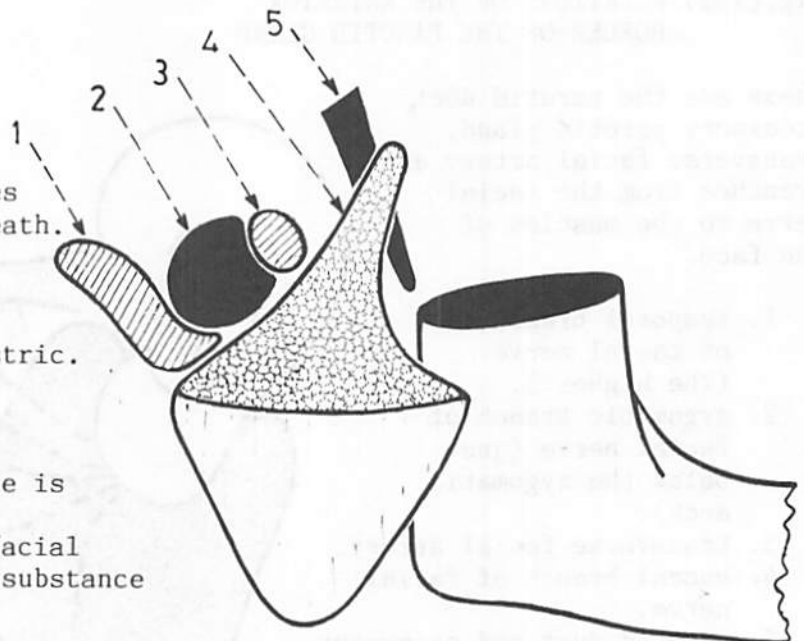


Fig.(155): FURTHER RELATIONS OF THE POSTEROMEDIAL SURFACE

1. styloid process (separates the gland from the internal jugular vein and internal carotid artery which lie within the carotid sheath).
2. external carotid artery (pierces the surface to enter the gland).
3. facial nerve (pierces the surface to enter the gland).
4. internal jugular vein.
5. internal carotid artery.
6. medial border of the gland (meeting of the anteromedial and posteromedial surfaces).

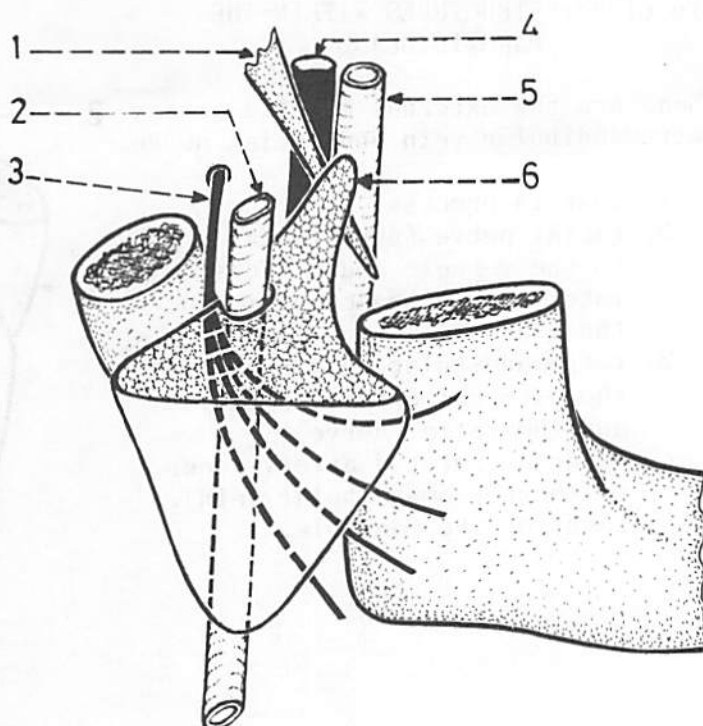


Fig.(156): RELATIONS OF SUPERFICIAL SURFACE OF THE PAROTID GLAND

This surface is related to the skin, fascia, parotid lymph nodes and branches of the great auricular nerve.

1. parotid lymph nodes.
2. sternomastoid muscle.
3. great auricular nerve (supplies the skin over the gland).
4. masseter muscle.
5. parotid duct.
6. accessory part of parotid gland.

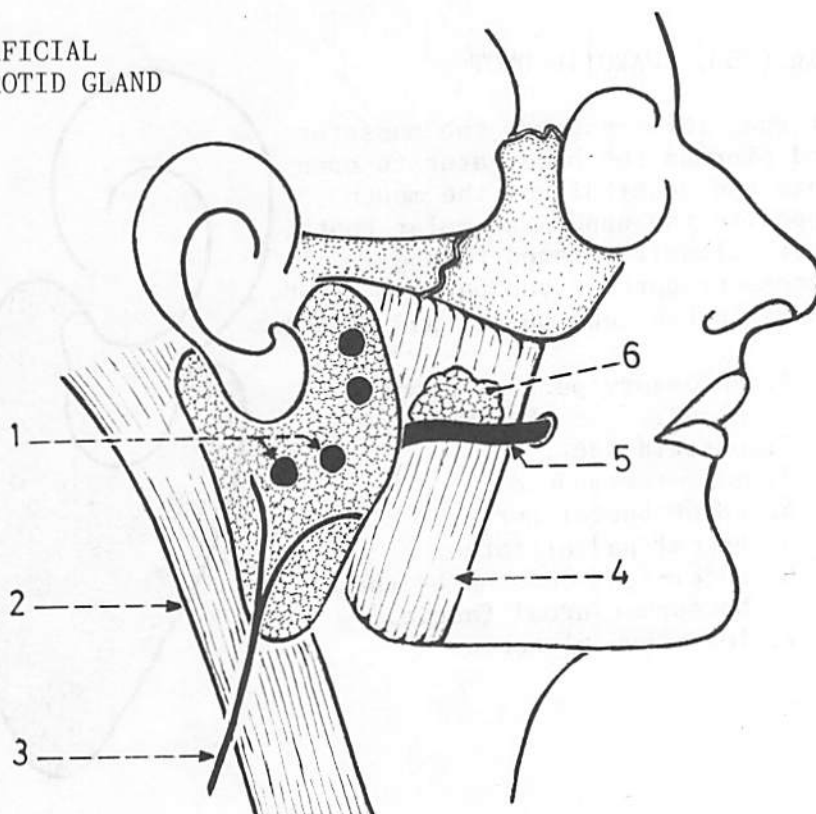


Fig.(157): STRUCTURES WITHIN THE PAROTID GLAND

These are the external carotid artery, 2—retromandibular vein and facial nerve.

1. mastoid process.
2. facial nerve (superficial to the vessels and divides into several branches within the gland).
3. retromandibular vein (between the external carotid artery and the facial nerve).
4. external carotid artery (deep to the retromandibular vein).
5. ramus of the mandible.

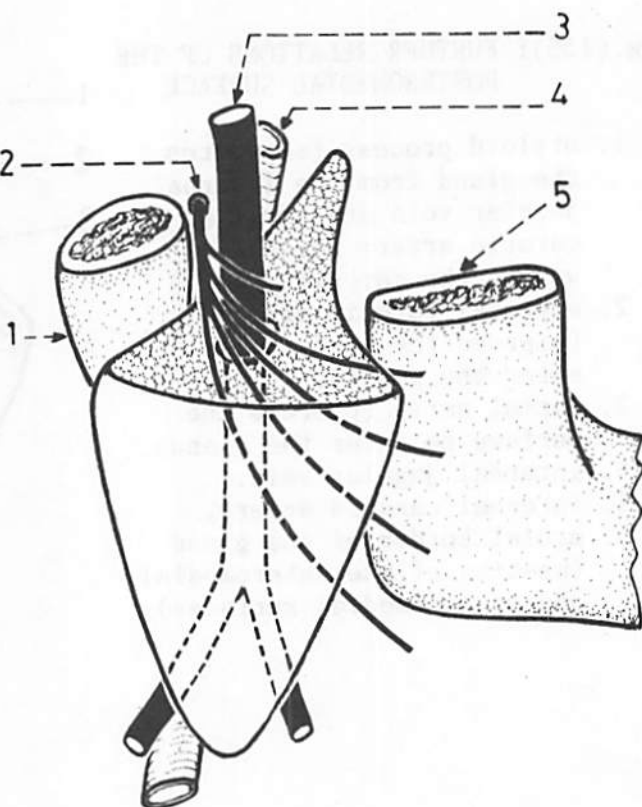


Fig.(158): PAROTID DUCT

It runs forwards over the masseter and pierces the buccinator to open into the vestibule of the mouth opposite the upper 2nd molar tooth. It is closely related to the accessory part of the parotid gland, buccal nerves and buccal pad of fat.

1. accessory part of parotid gland.
2. parotid duct.
3. masseter muscle.
4. upper buccal nerve.
5. buccal pad of fat.
6. buccinator covered by the buccopharyngeal fascia.
7. lower buccal nerve.

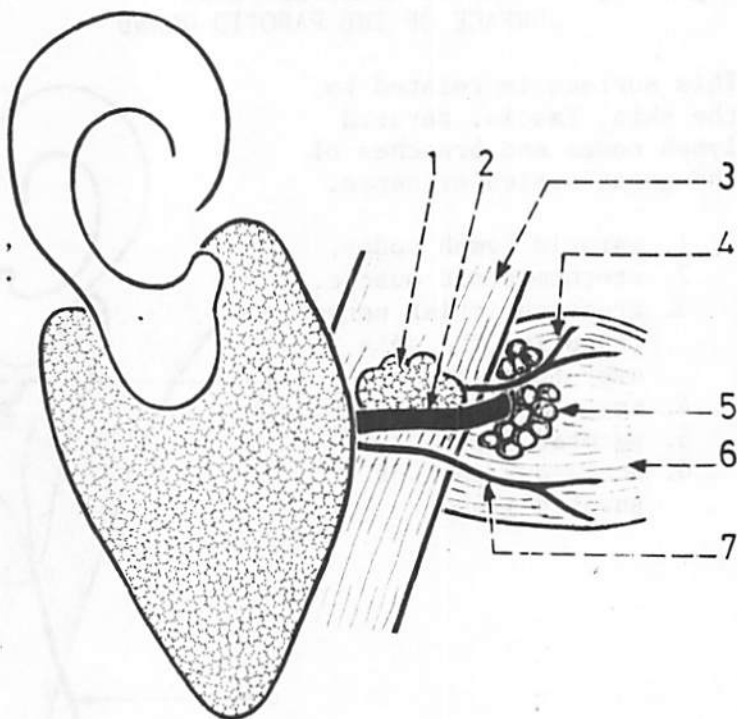


Fig.(159): SURFACE ANATOMY OF THE PAROTID DUCT

It corresponds to the middle 1/3 of a horizontal line drawn from the tragus of the ear (point 1) to a point midway between the ala of the nose and the angle of the mouth (point 2).

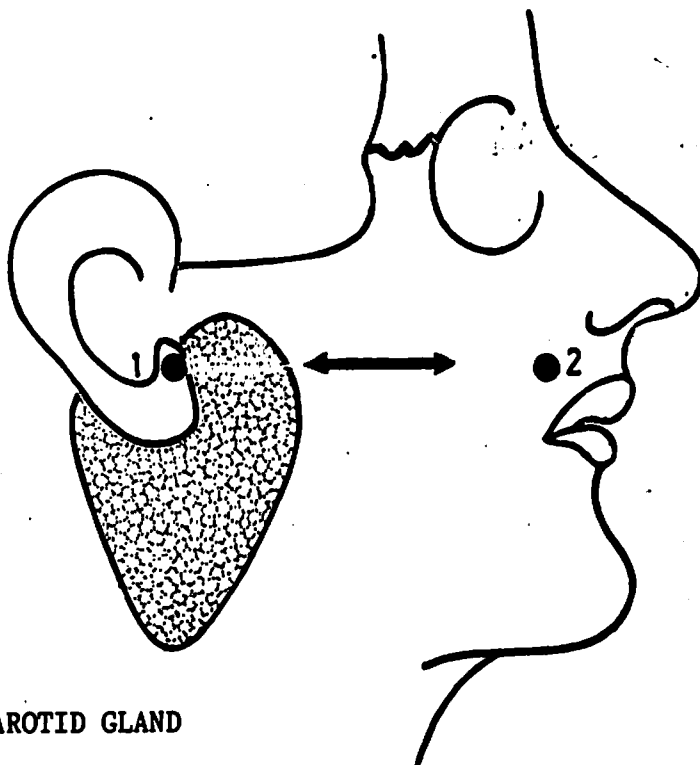


Fig.(160): SURFACE ANATOMY OF THE PAROTID GLAND

\* Anterior border: corresponds to a curved line drawn from the head of the mandible (point 1) to the middle of the masseter (point 2) to a point 2 cm below and behind the angle of the mandible (point 3).

\* Posterior border: corresponds to a straight line drawn from the lower end of the gland (point 3) to the mastoid process above (point 4).

\* Upper end: corresponds to a curved line concave upwards drawn across the lobule of the auricle from point (1) to point (4). This is actually an upper border rather than an end.

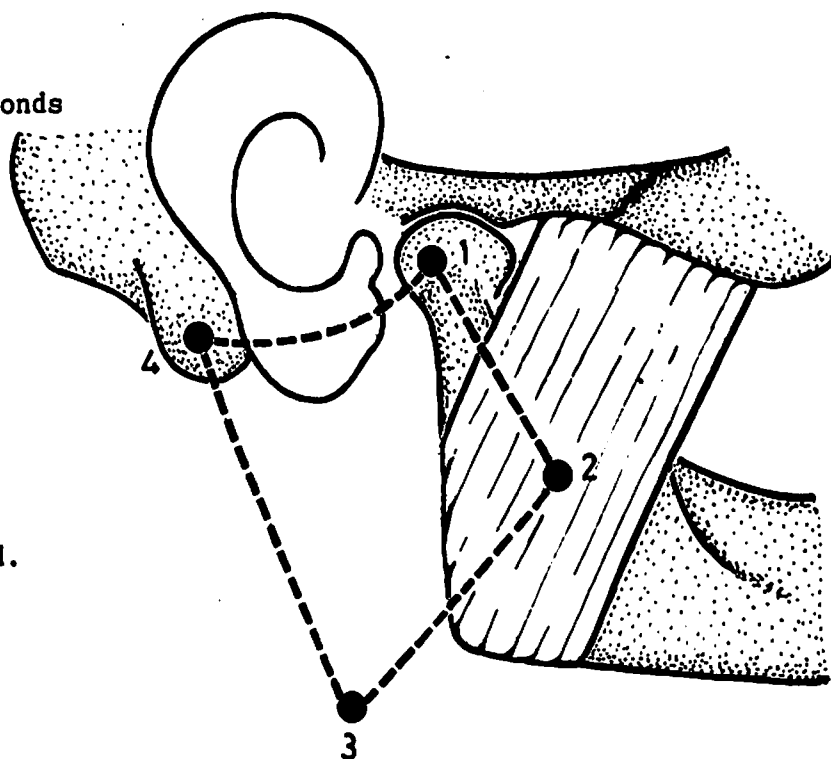


Fig.(161): PARASYMPATHETIC SUPPLY OF THE PAROTID GLAND

The parasympathetic (secretomotor) fibres to the parotid gland arise from the inferior salivary nucleus in the medulla oblongata. They pass within the glossopharyngeal nerve and leave it as the tympanic branch which enters the tympanic cavity. This branch leaves the ear as the lesser petrosal nerve which relays in the otic ganglion. Postganglionic fibres pass with the auriculotemporal nerve to the parotid gland.

1. inferior salivary nucleus.
2. glossopharyngeal nerve.
3. tympanic branch of the glossopharyngeal nerve.
4. tympanic cavity.
5. lesser petrosal nerve.
6. foramen ovale.
7. otic ganglion.
8. postganglionic fibres.
9. auriculotemporal nerve.
10. parotid gland.

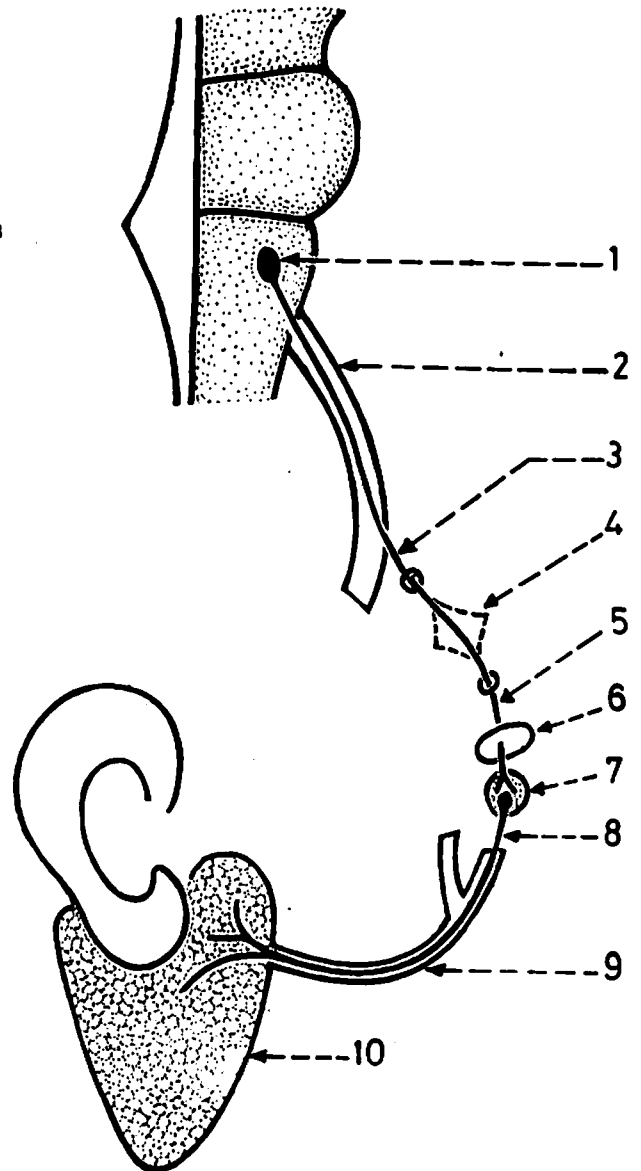
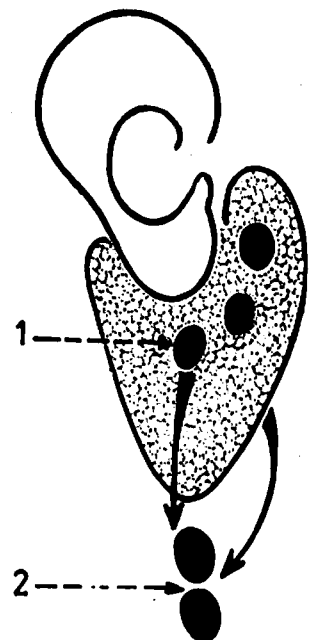


Fig.(162): LYMPH DRAINAGE OF PAROTID GLAND

It drains into superficial parotid nodes on its surface and deep parotid nodes in its substance. Efferent vessels from these nodes drain into the upper deep cervical nodes.

1. parotid lymph nodes.
2. deep cervical lymph nodes.



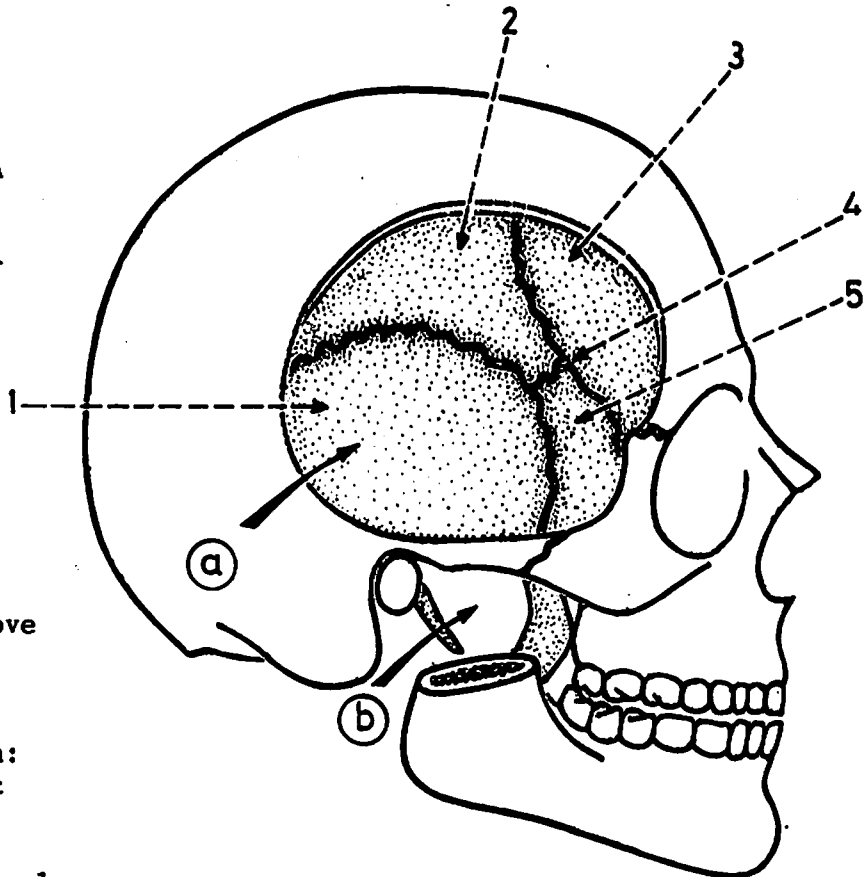


## TEMPORAL FOSSA

Fig.(163): FLOOR OF  
TEMPORAL FOSSA

It is formed of 4 bones which articulate together at the pterion.

1. squamous part of temporal bone.
2. parietal bone.
3. frontal bone.
4. pterion.
5. greater wing of sphenoid.



(a) temporal fossa: above the zygomatic arch.

(b) infratemporal fossa: below the zygomatic arch.

- \* Note that the temporal fossa is filled with the temporalis muscle and its covering fascia. Deep to the muscle lie the deep temporal vessels and temporal branches of the mandibular nerve which supply the muscle.

Fig.(164): ATTACHMENTS OF  
TEMPORAL FASCIA

The temporal fascia is a thick layer of deep fascia which covers the superficial surface of the temporalis muscle. It is attached to the outline of the temporal fossa, i.e. to the superior temporal line above and behind, upper border of zygomatic arch below and the frontal process of zygomatic bone in front.

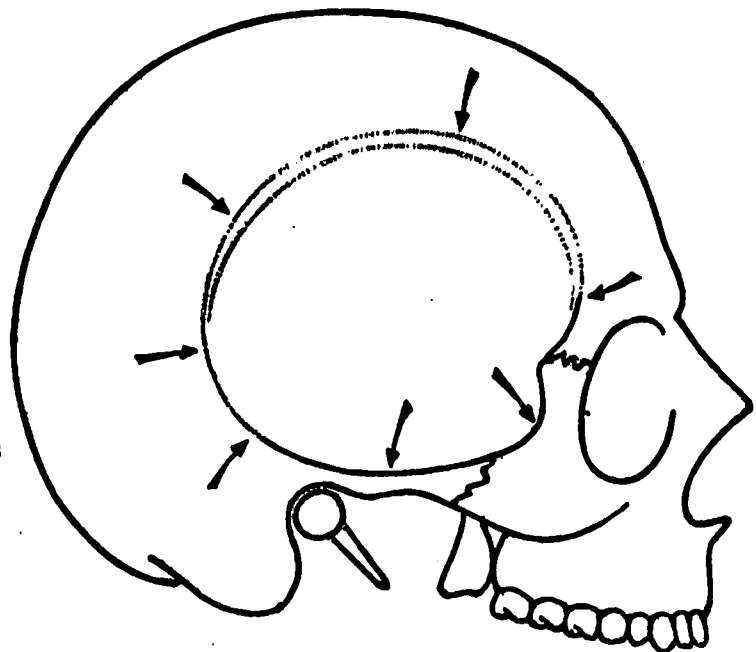


Fig.(165): TEMPORALIS MUSCLE

It is a fan-shaped muscle which arises from the whole temporal fossa. Its tendon of insertion descends deep to the zygomatic arch to get inserted into the coronoid process of the mandible.

1. superior temporal line  
(gives attachment to the temporal fascia).
2. origin of temporalis  
(the fibres have different directions).
3. insertion into the coronoid process.

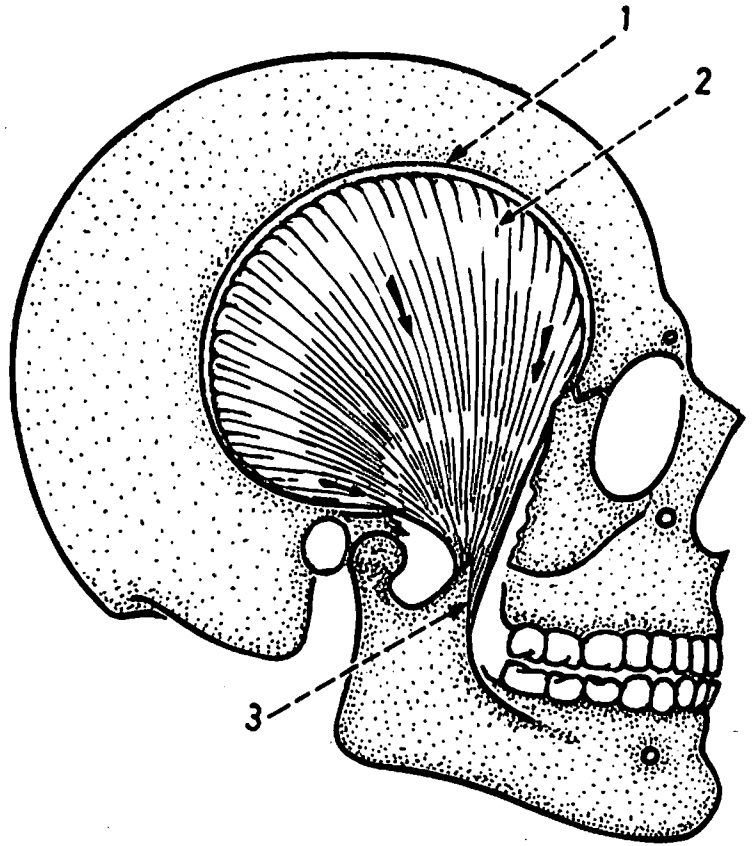


Fig.(166): POSITION OF THE TENDON OF INSERTION OF TEMPORALIS

As the tendon of insertion of the temporalis muscle descends deep to the zygomatic arch it gets inserted into the coronoid process and extends down along the anterior border of the ramus forming together the lateral wall of the infratemporal fossa.

1. lateral pterygoid muscle.
2. tendon of insertion of temporalis.
3. medial pterygoid muscle.

\* The lateral and medial pterygoid muscles are contents of the infratemporal fossa.

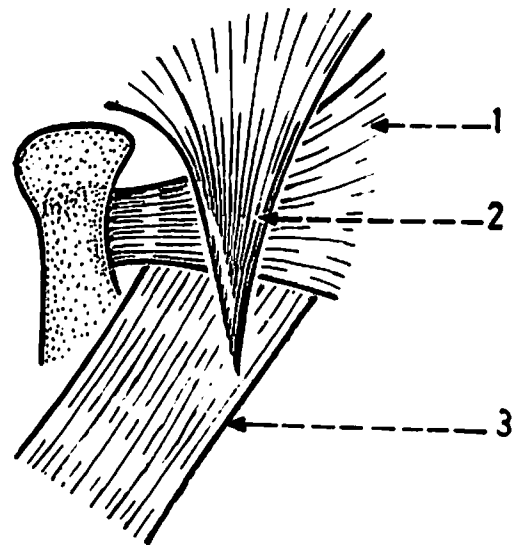


Fig.(167): ACTION OF TEMPORALIS MUSCLE

The whole muscle elevates the mandible. However, its posterior horizontal fibres draw the mandible backwards (retract it).

1. anterior fibres: slightly oblique.
2. middle fibres: vertical.
3. posterior fibres: horizontal.

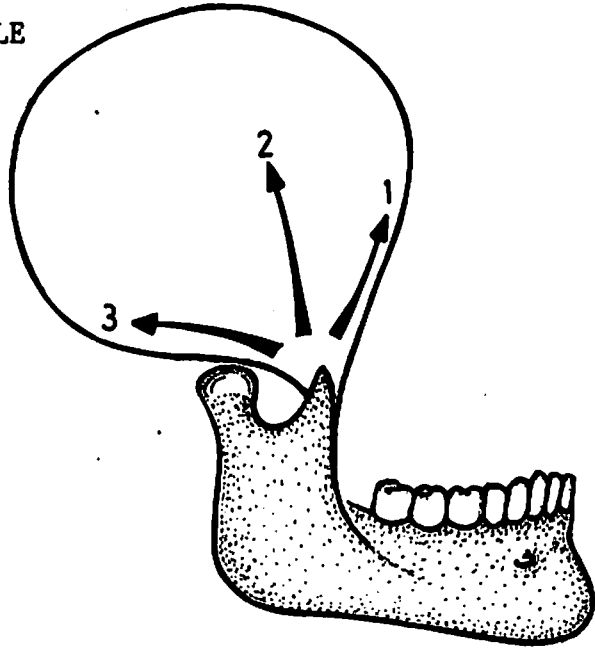
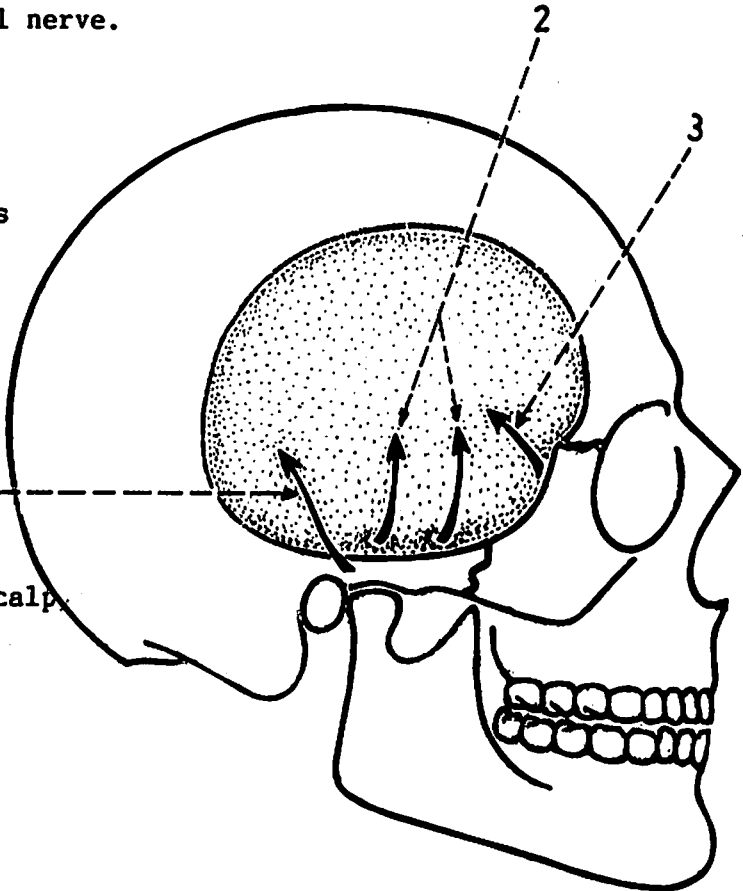


Fig.(168): VESSELS AND NERVES IN THE TEMPORAL FOSSA

The arteries are the middle and deep temporal arteries, while the nerves are the zygomaticotemporal nerve and temporal branches of the mandibular nerve.

1. middle temporal artery (from the superficial temporal artery and grooves the bone just above the external acoustic meatus).
2. deep temporal arteries accompanied by temporal branches of the mandibular nerve (they run in contact with the bone deep to the temporalis).
3. zygomaticotemporal nerve<sup>1</sup> (from the zygomatic branch of the maxillary nerve; it supplies the skin of the scalp).



# INFRATEMPORAL FOSSA

## MUSCLES OF MASTICATION

Fig.(169): MASSETER MUSCLE

It is a quadrilateral muscle which covers the lateral surface of the ramus of the mandible. It consists of 2 parts: superficial and deep.

1. origin from the lower border of zygomatic arch.
2. insertion into the lateral surface of the ramus of the mandible.
3. superficial oblique part.
4. deep vertical part.

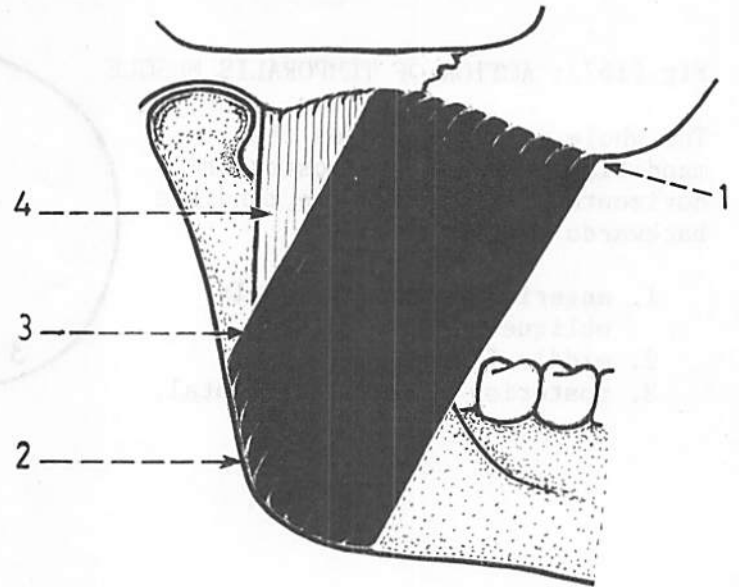


Fig.(170): ACTION OF MASSETER

The whole muscle elevates the mandible, while its superficial part helps in protrusion of the mandible.

- (a) elevation of the mandible by the deep part.
- (b) elevation and protrusion by the superficial part.

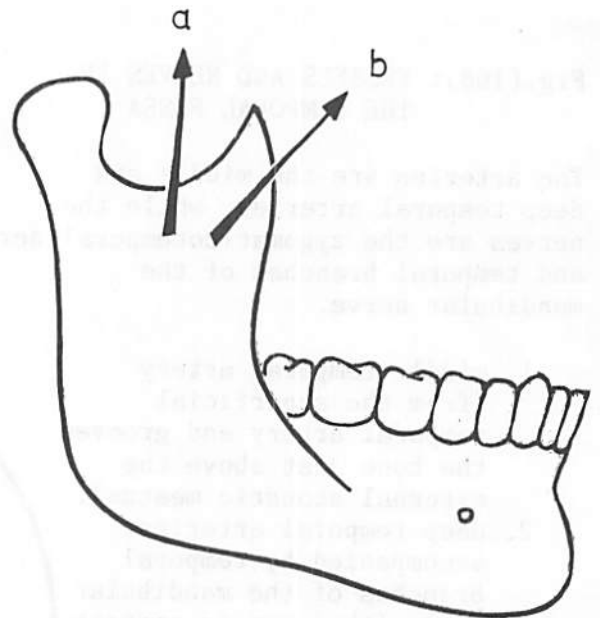


Fig.(171): NERVE SUPPLY OF MASSETER

The nerve to masseter is a branch from the mandibular nerve which passes through the mandibular notch to enter the deep surface of the muscle.

1. nerve to masseter.
2. masseter muscle.

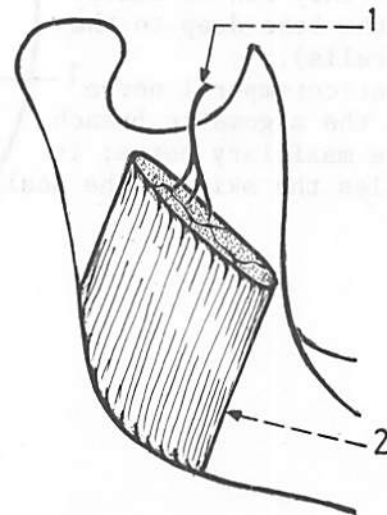
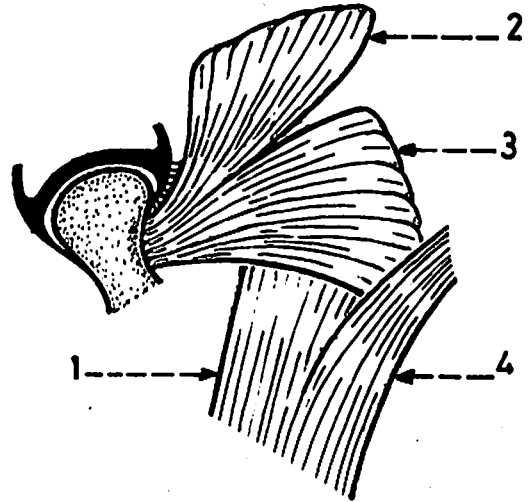


Fig.(172): LATERAL AND MEDIAL PTERYGOID MUSCLES

The lateral pterygoid lies horizontally deep to the ramus of the mandible and the tendon of insertion of the temporalis. It has an upper head and a lower head.

The medial pterygoid lies obliquely and has 2 heads: a deep head deep to the lower head of the lateral pterygoid and a small superficial head superficial to the lower head of the lateral pterygoid.



1. medial pterygoid muscle (deep head).
2. upper head of lateral pterygoid muscle.
3. lower head of lateral pterygoid muscle.
4. medial pterygoid muscle (superficial head).

Fig.(173): ORIGIN OF PTERTYGOID MUSCLES

1. origin of upper head of lateral pterygoid: from the infratemporal surface and infratemporal crest of the greater wing of sphenoid.
2. origin of lower head of lateral pterygoid: from the lateral surface of the lateral pterygoid plate.
3. origin of superficial head of medial pterygoid: from the maxillary tuberosity.

\* The deep head of the medial pterygoid is not seen in this figure as it arises from the medial surface of the lateral pterygoid plate.

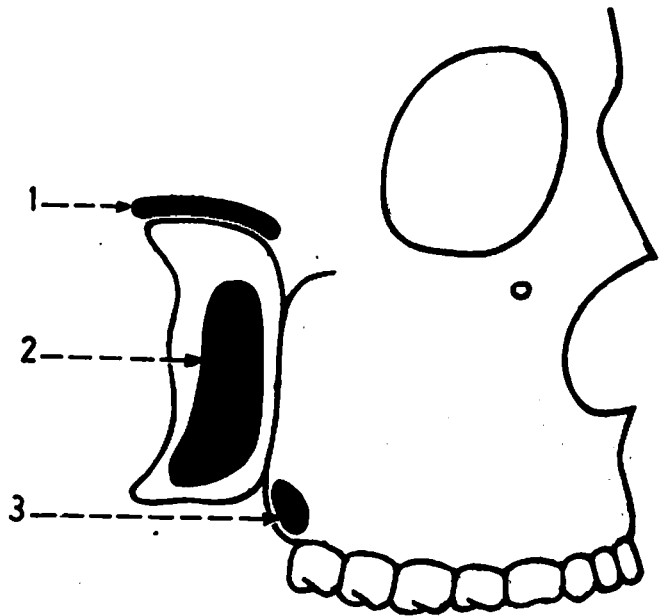


Fig.(174): LATERAL PTERYGOID MUSCLE

The muscle arises by 2 heads which are separated from each other by the terminal part of the maxillary artery and the buccal branch of the mandibular nerve. It is inserted into the front of the neck of the mandible, capsule of the temporomandibular joint and its articular disc.

1. capsule and articular disc of temporomandibular joint.
2. upper head of lateral pterygoid.
3. origin of upper head from the infratemporal surface of the greater wing of sphenoid.
4. pterygomaxillary fissure.
5. terminal part of maxillary artery.
6. origin of lower head from the lateral pterygoid plate.
7. lower head of lateral pterygoid.
8. buccal branch of mandibular nerve (sensory to the cheek).
9. insertion of the muscle into the neck of the mandible, articular disc and capsule of the temporomandibular joint.

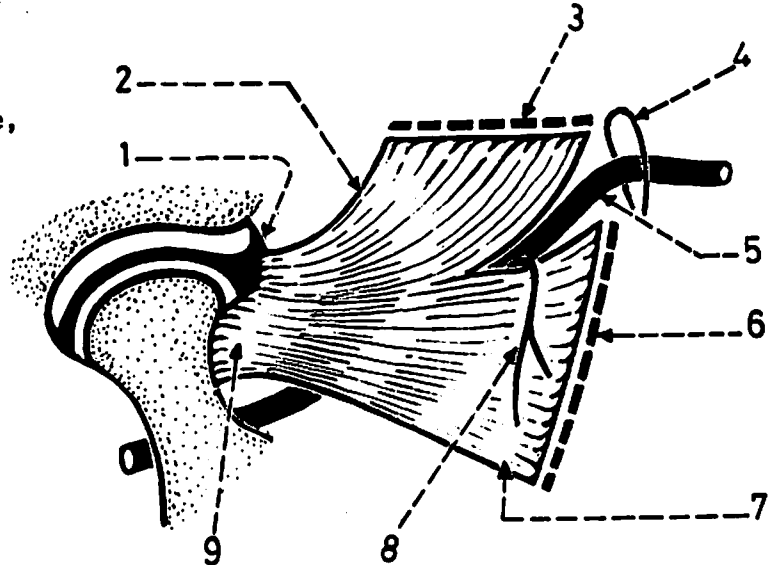


Fig.(175): RELATIONS OF LATERAL PTERYGOID

It lies between the tendon of insertion of temporalis laterally and the medial pterygoid medially. The maxillary artery passes deep (or superficial) to it. The lingual and inferior alveolar nerves descend between the lateral and medial pterygoid muscles.

1. temporalis muscle.
2. maxillary artery.
3. lateral pterygoid muscle.
5. medial pterygoid muscle.
5. lingual nerve.
6. inferior alveolar nerve.

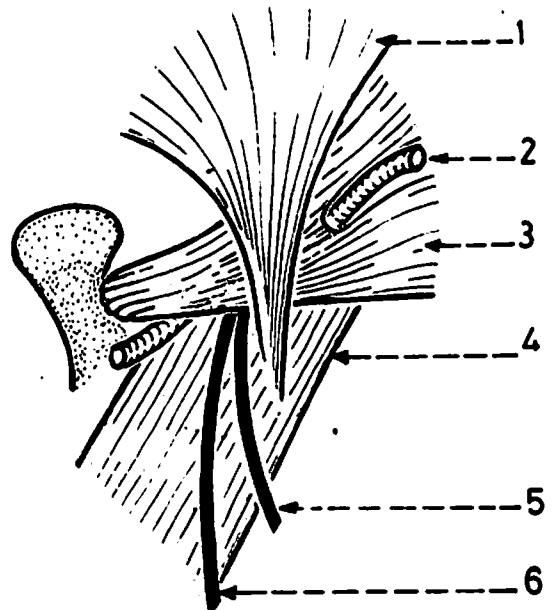


Fig.(176): STRUCTURES DEEP TO THE LATERAL PTERYGOID

These are mainly the mandibular nerve, middle meningeal artery and sometimes the 2nd part of the maxillary artery.

1. inferior alveolar nerve.
2. 1st part of maxillary artery.
3. lateral pterygoid (reflected).
4. spine of sphenoid.
5. middle meningeal artery.
6. mandibular nerve.
7. lingual nerve (joined above by the chorda tympani).
8. medial pterygoid.

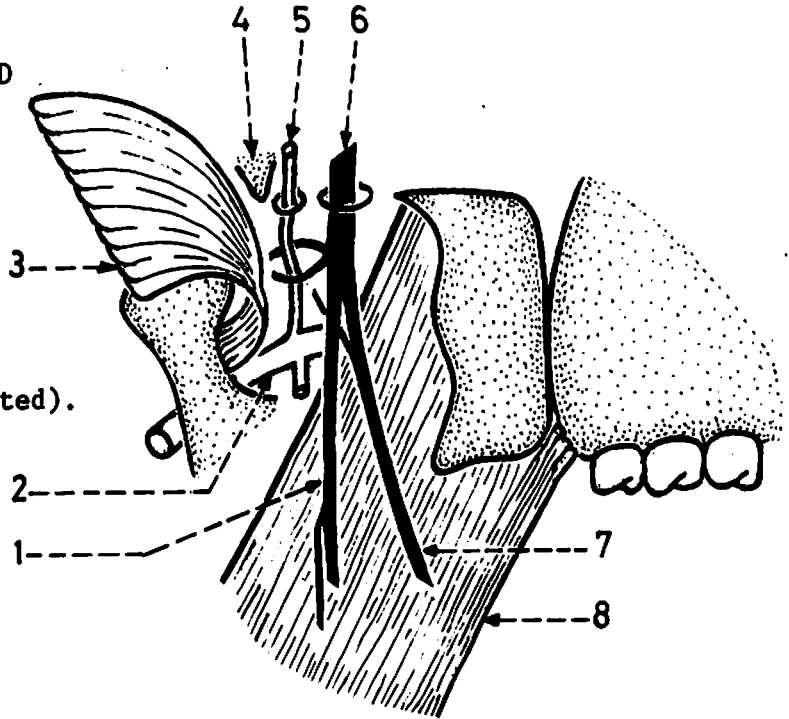
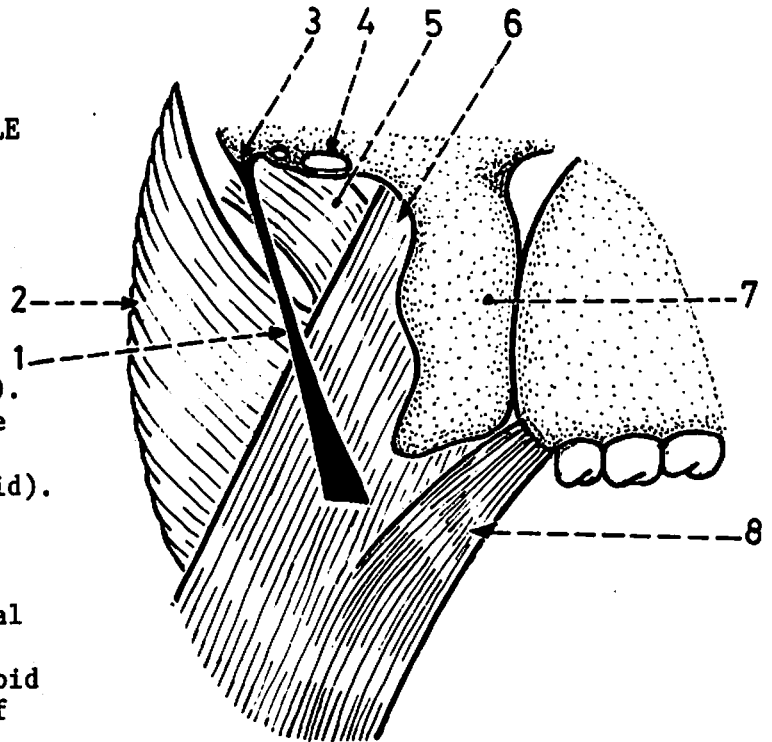


Fig.(177): MEDIAL PTERYGOID MUSCLE

It arises by a large deep head and a small superficial head, and runs downwards and backwards deep to the lateral pterygoid.

1. sphenomandibular ligament (superficial to the muscle).
2. superior constrictor muscle of the pharynx (behind and deep to the medial pterygoid).
3. spine of sphenoid.
4. foramen ovale.
5. tensor palati muscle (lies above and deep to the medial pterygoid).
6. deep head of medial pterygoid (from the medial surface of lateral pterygoid plate).
7. lateral pterygoid plate.
8. superficial head of medial pterygoid (from the maxillary tuberosity).



\* Note the oblique upper border of the medial pterygoid which is separated from the foramen ovale by the tensor palati muscle.

Fig.(178): MUSCLES DEEP TO THE  
MEDIAL PTERYGOID

These are the tensor palati muscle and the superior constrictor muscle of the pharynx.

1. tensor palati muscle.
2. superior constrictor muscle of the pharynx.
3. medial pterygoid (cut).
4. pterygomandibular ligament (gives origin to the superior constrictor).
5. lateral pterygoid plate.
6. base of the skull.

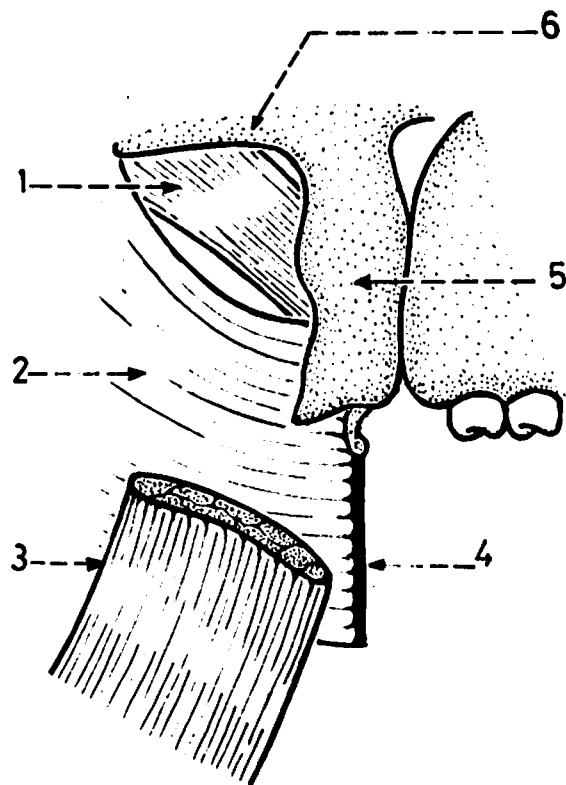


Fig.(179): INSERTION OF MEDIAL PTERYGOID

It is inserted into the medial surface of the ramus of the mandible below the mandibular foramen. Its fibres are parallel to those of the masseter.

1. insertion of medial pterygoid.
2. masseter muscle (on the lateral surface of the ramus).

\* This figure shows the inner surface of the ramus.

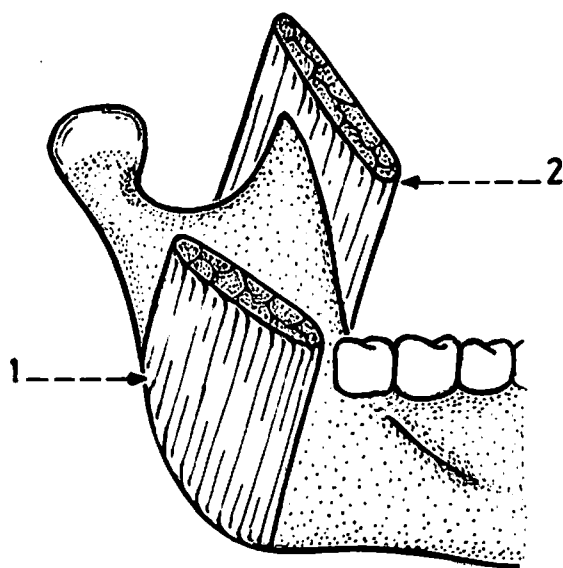




Fig.(180): ACTION OF PTERYGOID MUSCLES

1. protrusion of the mandible by lateral pterygoid.
  2. elevation and protrusion of the mandible by medial pterygoid.
  3. pushing the mandible to the opposite side by both lateral and medial pterygoid muscles.
- \* By alternating action of the pterygoid muscles of the 2 sides, the mandible moves from side to side (chewing movement).

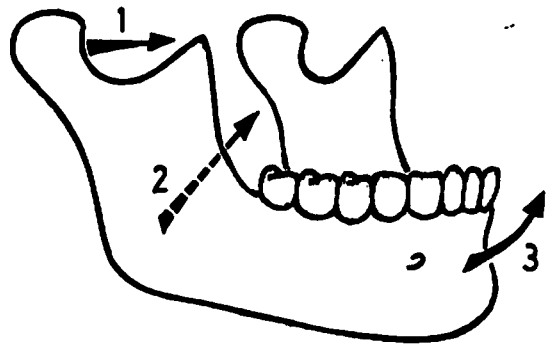


Fig.(181): OPENING OF THE MOUTH BY LATERAL PTERYGOID

The lateral pterygoid pulls the head of the mandible forwards over the articular eminence (tubercle). This leads to opening of the mouth.

- (a) position of the mandible with the mouth closed.
- (b) position of the mandible with the mouth open.

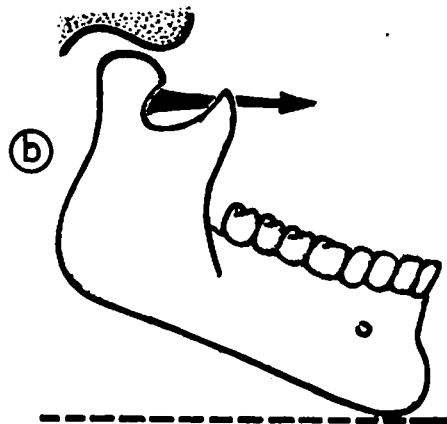
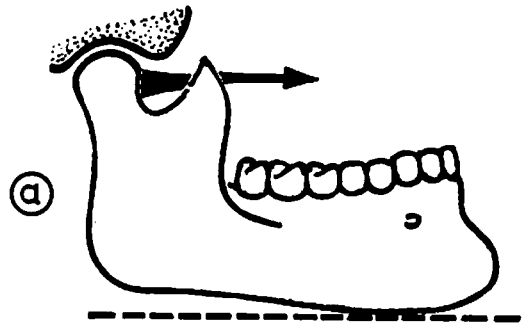


Fig.(182): ORIGINS OF MASSETER, PTERYGIDS  
AND TENSOR PALATI MUSCLES

1. origin of deep head of medial pterygoid from the medial surface of the lateral pterygoid plate.
2. origin of tensor palati from the scaphoid fossa.
3. origin of masseter from the lower border of the zygomatic arch.
4. origin of upper head of lateral pterygoid from the infra-temporal surface and infra-temporal crest of the greater wing of sphenoid.

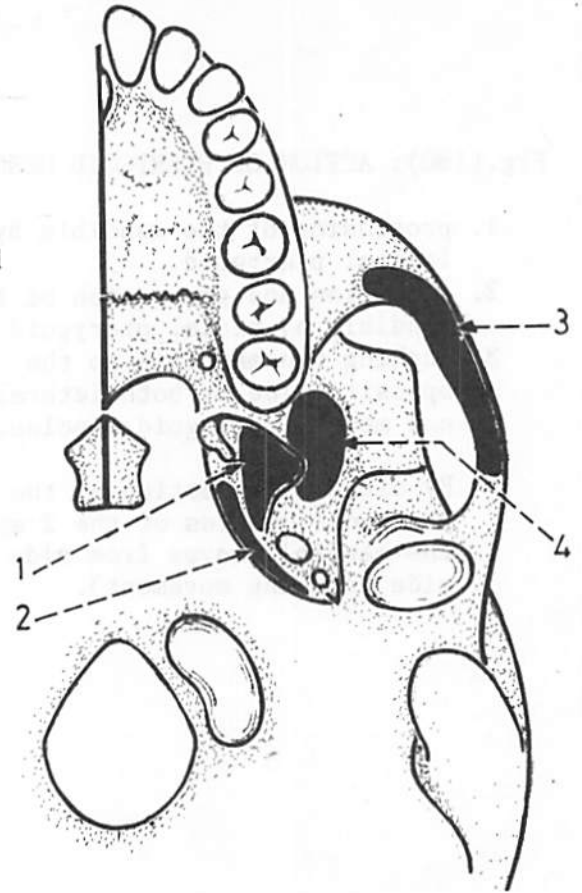
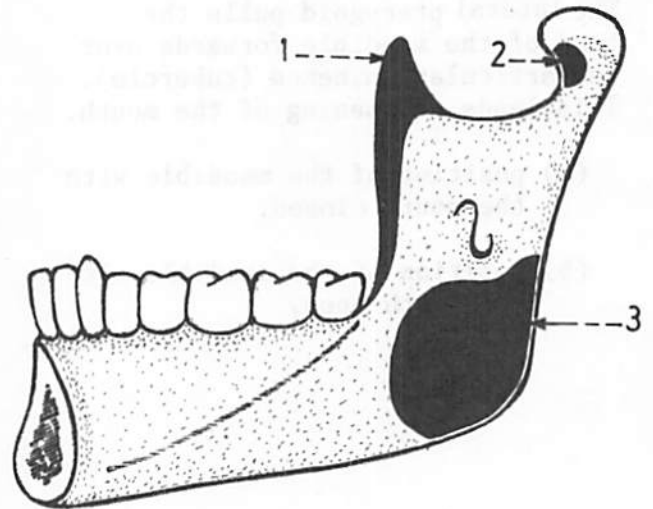


Fig.(183): INSERTIONS OF TEMPORALIS  
AND PTERYGOID MUSCLES

1. insertion of temporalis into the coronoid process and anterior border of the ramus.
2. insertion of lateral pterygoid into the front of the neck of the mandible.
3. insertion of medial pterygoid into the medial surface of the ramus below the mandibular foramen.



\* Note that all muscles of mastication arise from the skull and are inserted into the ramus of the mandible.

Fig.(184): ORIGINS OF MUSCLES  
OF MASTICATION

All the muscles of mastication arise from the bones of the skull.

1. temporalis: from the floor of the temporal fossa.
2. lateral pterygoid: from the infratemporal surface and crest of the greater wing of sphenoid and lateral surface of the lateral pterygoid plate.
3. masseter: from the lower border of zygomatic arch.
4. medial pterygoid: from the maxillary tuberosity and medial surface of the lateral pterygoid plate.

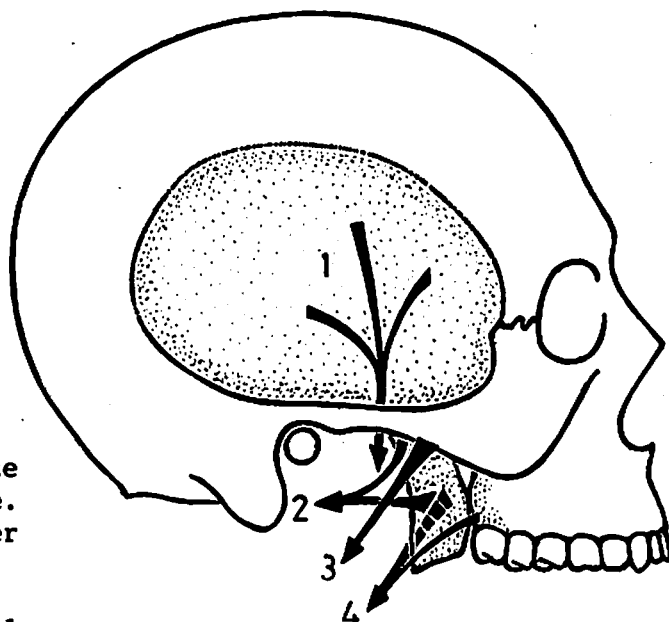
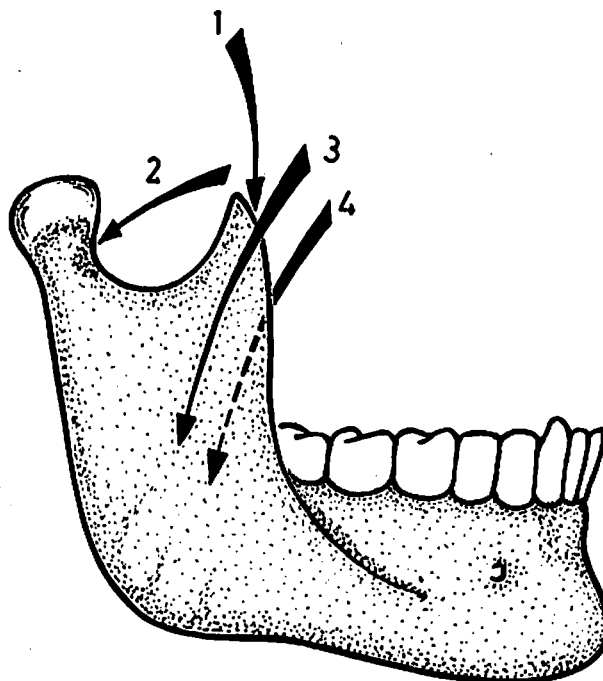


Fig.(185): INSERTIONS OF MUSCLES  
OF MASTICATION

All the muscles of mastication are inserted into the ramus of the mandible.

1. temporalis: into the coronoid process.
2. lateral pterygoid: into the front of the neck of the mandible.
3. masseter: into the lateral surface of the ramus.
4. medial pterygoid: into the medial surface of the ramus.



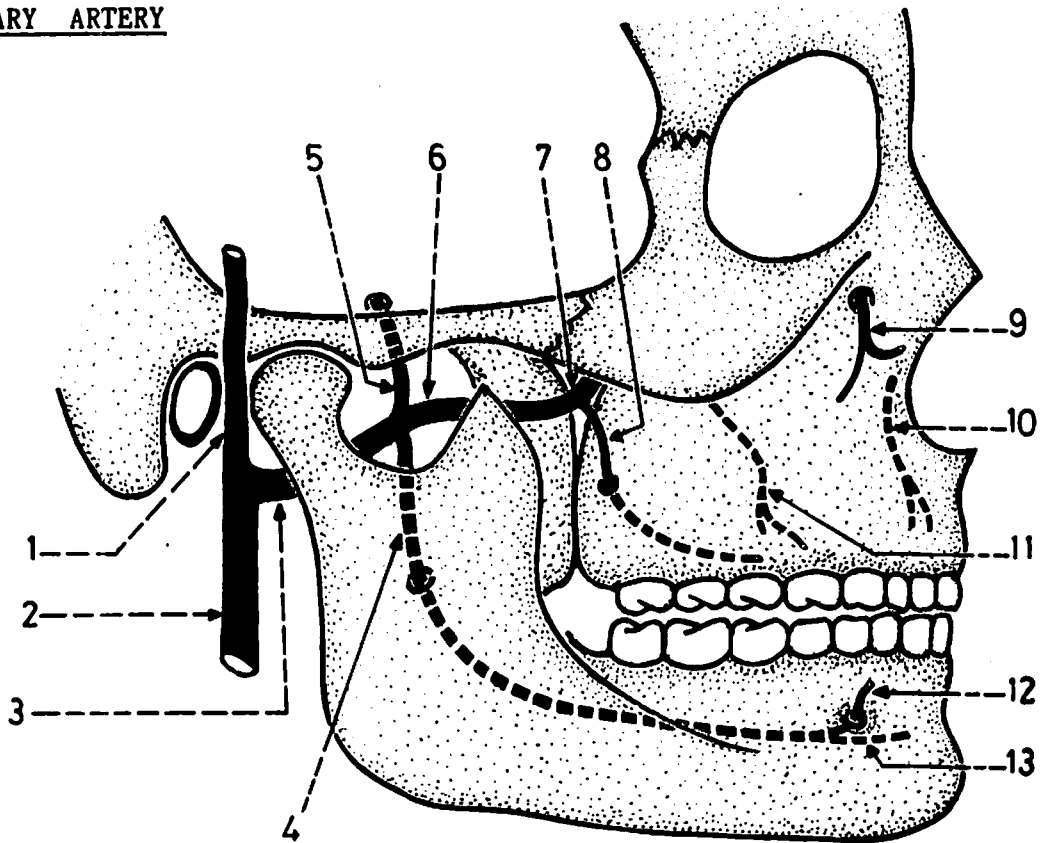
MAXILLARY ARTERY

Fig.(186): COURSE OF THE MAXILLARY ARTERY

It arises behind the neck of the mandible as one of the 2 terminal divisions of the external carotid artery. It passes forwards medial to the neck of the mandible in the infratemporal fossa where it lies either superficial or deep to the lower head of the lateral pterygoid. It then enters the pterygopalatine fossa where it ends by giving off terminal branches .

1. superficial temporal artery.
2. external carotid artery.
3. beginning of maxillary artery.
4. inferior alveolar artery (enters the mandibular canal).
5. middle meningeal artery (enters the middle cranial fossa).
6. maxillary artery in the infratemporal fossa.
7. end of maxillary artery in the pterygopalatine fossa.
8. posterior superior alveolar artery.
9. termination of infraorbital artery.
10. anterior superior alveolar artery.
11. middle superior alveolar artery.
12. mental artery.
13. incisive artery.

\* It should be noted that the maxillary artery is related to 2 nerves: the mandibular nerve in the infratemporal fossa and the maxillary nerve in the pterygopalatine fossa.

Fig.(187): PARTS OF MAXILLARY ARTERY

It is divided into 3 parts by the lateral pterygoid. The 1st part lies deep to the neck of the mandible, the 2nd part lies deep or superficial to the lower head of lateral pterygoid and the 3rd part passes between the 2 heads of lateral pterygoid to enter the pterygopalatine fossa.

1. auriculotemporal nerve (just above the 1st part).
2. 1st part of maxillary artery.
3. 3rd part of maxillary artery.
4. pterygomaxillary fissure.
5. maxillary nerve.
6. pterygopalatine ganglion.
7. end of maxillary artery in the pterygopalatine fossa.

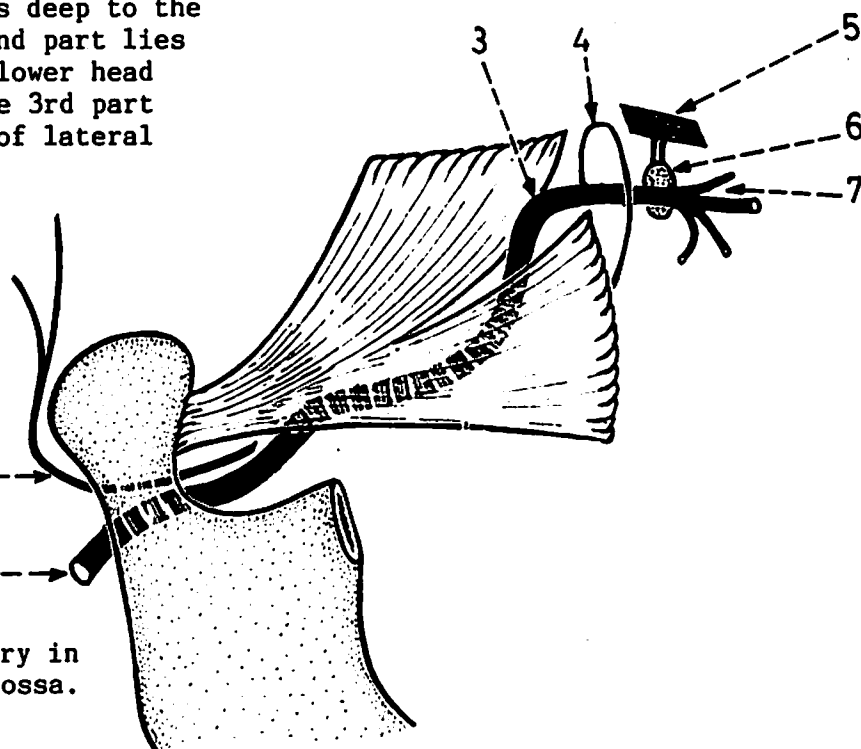


Fig.(188): BRANCHES OF 1st PART OF MAXILLARY ARTERY

These are 5 branches: deep auricular, anterior tympanic, middle meningeal, accessory meningeal and inferior alveolar.

1. auriculotemporal nerve.
2. deep auricular artery.
3. anterior tympanic artery.
4. 1st part of maxillary artery.
5. inferior alveolar artery.
6. head of the mandible.
7. middle meningeal artery.
8. accessory meningeal artery.

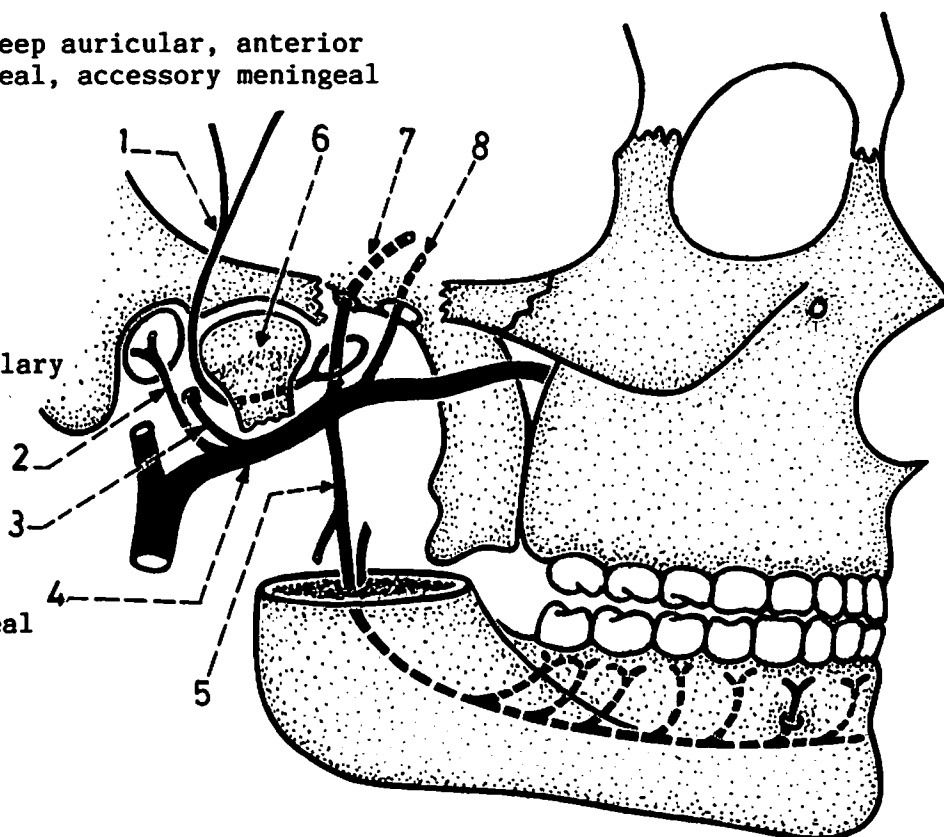
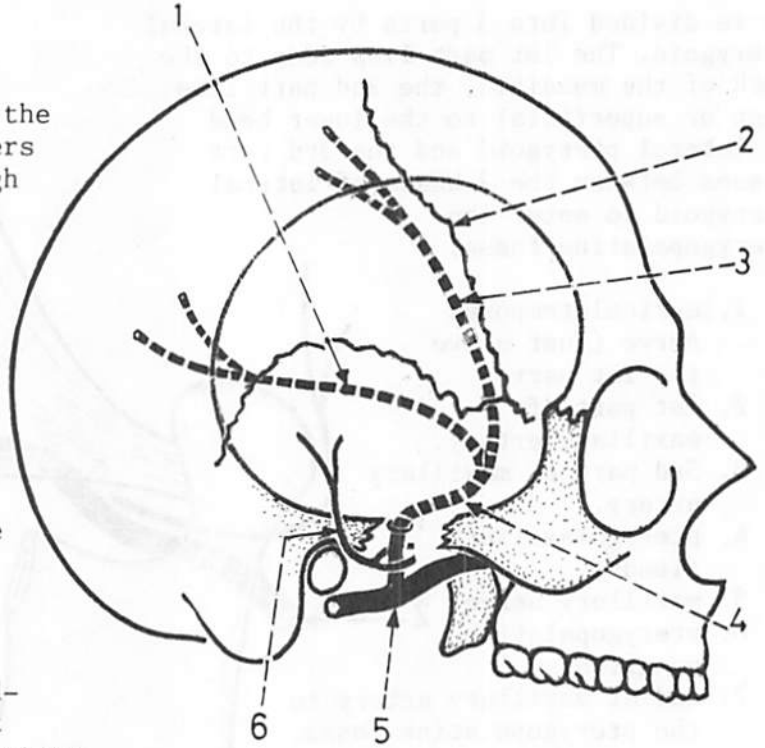


Fig.(189): MIDDLE MENINGEAL ARTERY

It arises from the 1st part of the maxillary artery and runs upwards between the 2 roots of the auriculotemporal nerve. It enters the middle cranial fossa through the foramen spinosum where it divides into anterior and posterior branches.

1. posterior branch (passes backwards).
2. coronal suture.
3. anterior branch (passes upwards 1 cm behind the coronal suture).
4. stem of the artery in the middle cranial fossa.
5. maxillary artery in the infratemporal fossa.
6. auriculotemporal nerve with its 2 roots surrounding the extracranial part of the middle meningeal artery.



- \* The anterior branch grooves the bone at the pterion deeply. This groove may be converted into a canal.

Fig.(190): RELATIONS OF MIDDLE MENINGEAL ARTERY IN THE INFRATEMPORAL FOSSA

It lies behind the trunk of the mandibular nerve where it is surrounded by the 2 roots of the auriculotemporal nerve. It runs between 2 muscles: lateral pterygoid (superficial) and tensor palati (deep).

1. medial pterygoid muscle.
2. roots of auriculotemporal nerve.
3. tensor palati muscle (deep to the artery).
4. middle meningeal artery passing through the foramen spinosum.
5. trunk of mandibular nerve.
6. lateral pterygoid plate.

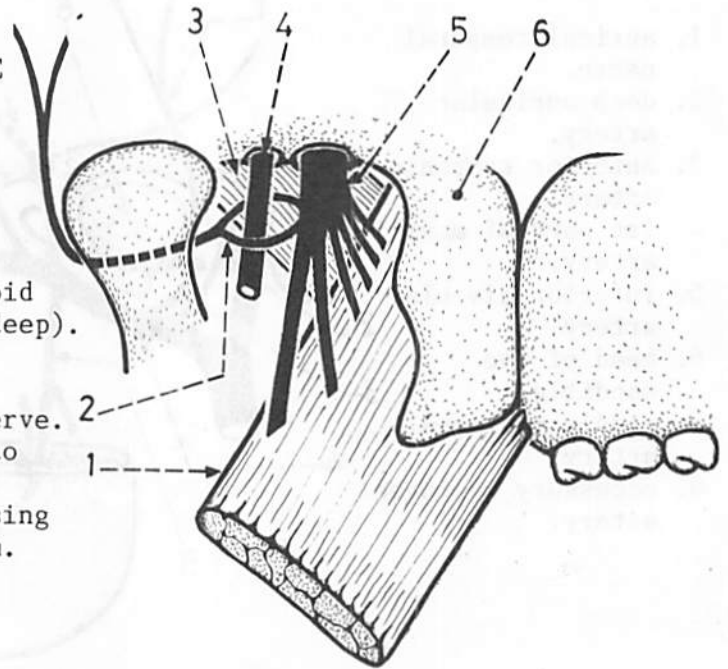
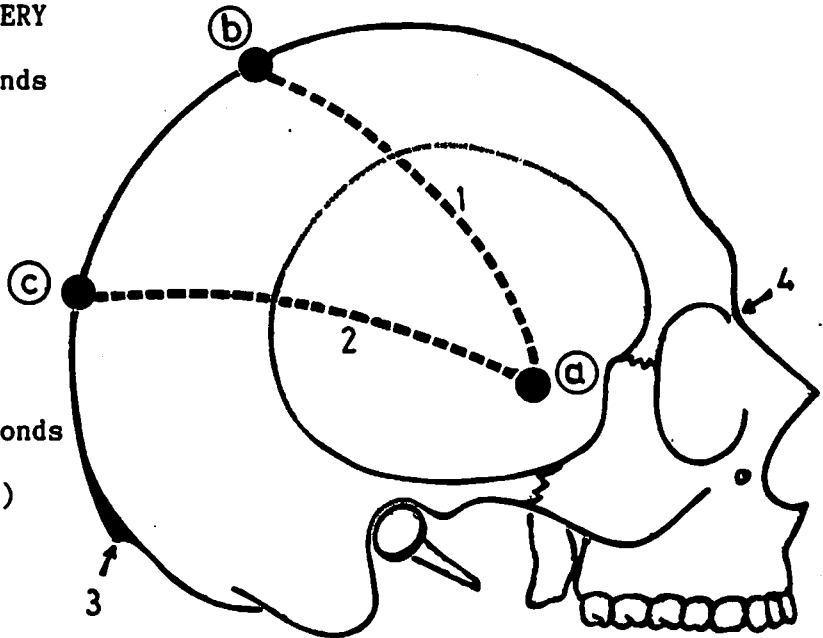


Fig.(191): SURFACE ANATOMY OF  
MIDDLE MENINGEAL ARTERY

1. anterior branch: corresponds to a line drawn upwards and slightly backwards from the pterion (point a) to point (b) midway between the nasion andinion. The pterion lies 4 cm above the middle of the zygomatic arch and 4 cm behind the frontozygomatic suture.
2. posterior branch: corresponds to a line drawn backwards from the pterion (point a) to the lambda (point c).
3. inion (tip of external occipital protuberance).
4. nasion.



\* The foramen spinosum corresponds to the middle of the upper border of the zygomatic arch, and a line drawn from this point to the pterion represents the stem of the cranial part of the middle meningeal artery.

Fig.(192): INJURY TO THE MIDDLE MENINGEAL ARTERY

The artery may be torn in fractures of the skull at the pterion leading to extradural haemorrhage, i.e. between the dura and the bone. The resulting haematoma may compress the motor area present in the precentral gyrus of the brain.

1. fracture of the bone at the pterion.
2. extradural haemorrhage.
3. anterior branch of middle meningeal artery (torn).
4. dura mater.
5. precentral gyrus of the brain.

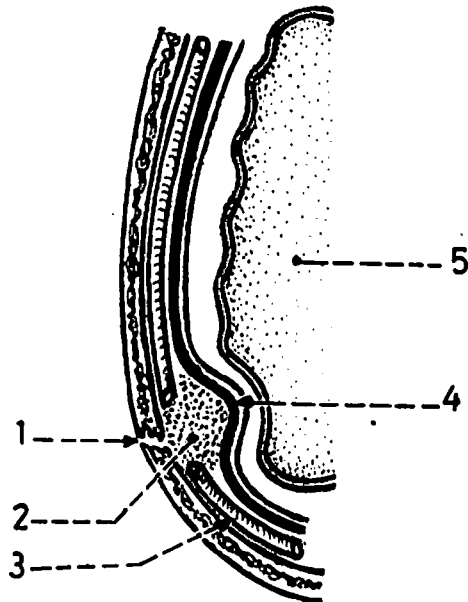


Fig.(193): BRANCHES OF 2nd PART OF MAXILLARY ARTERY

These are muscular branches to the muscles of mastication in addition to the buccal branch which accompanies the buccal branch of the mandibular nerve.

1. deep temporal branches to the temporalis muscle.
2. branches to pterygoid muscles.
3. a branch to the masseter muscle.
4. buccal branch to the buccinator.

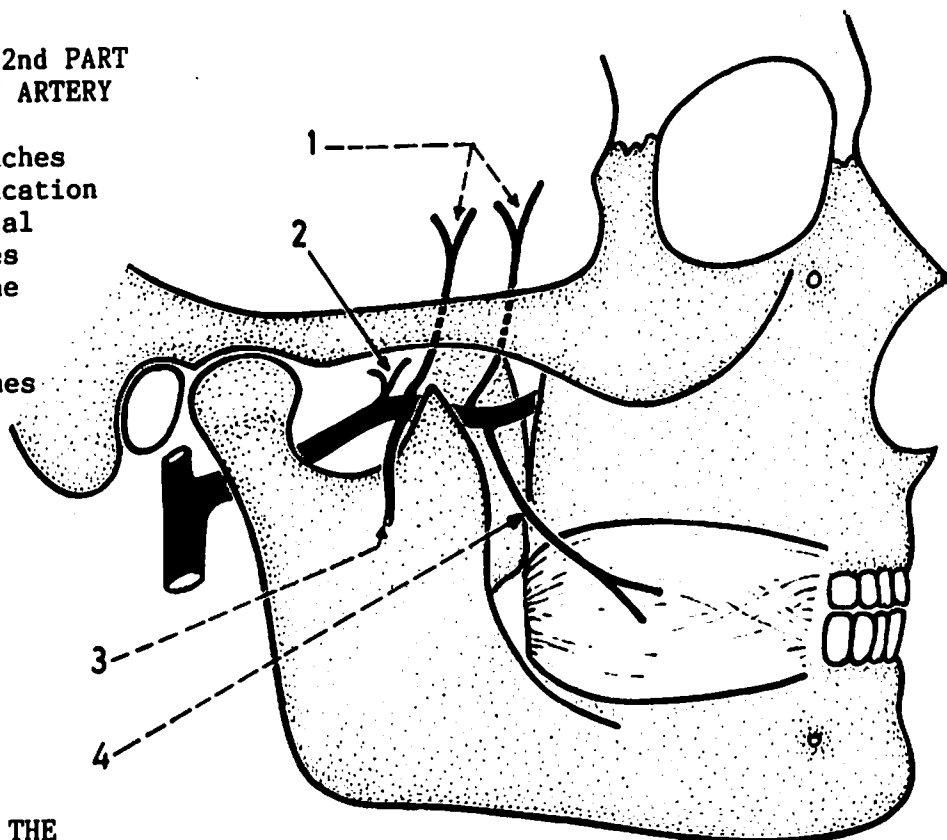


Fig.(194): 3rd PART OF THE MAXILLARY ARTERY

It is the terminal part of the artery which lies in the pterygo-palatine fossa.

1. 3rd part of maxillary artery.
2. infraorbital artery (from the maxillary).
3. termination of the infra-orbital artery.
4. anterior superior alveolar artery (from infraorbital).
5. middle superior alveolar artery (from infraorbital).
6. posterior superior alveolar artery (from maxillary).

\* The other branches of the 3rd part are not shown in the figure; these are the greater palatine, sphenopalatine 6 and artery of pterygoid canal.

\* Note that the upper jaw has 3 superior alveolar arteries, while the mandible has only one artery (inferior alveolar).

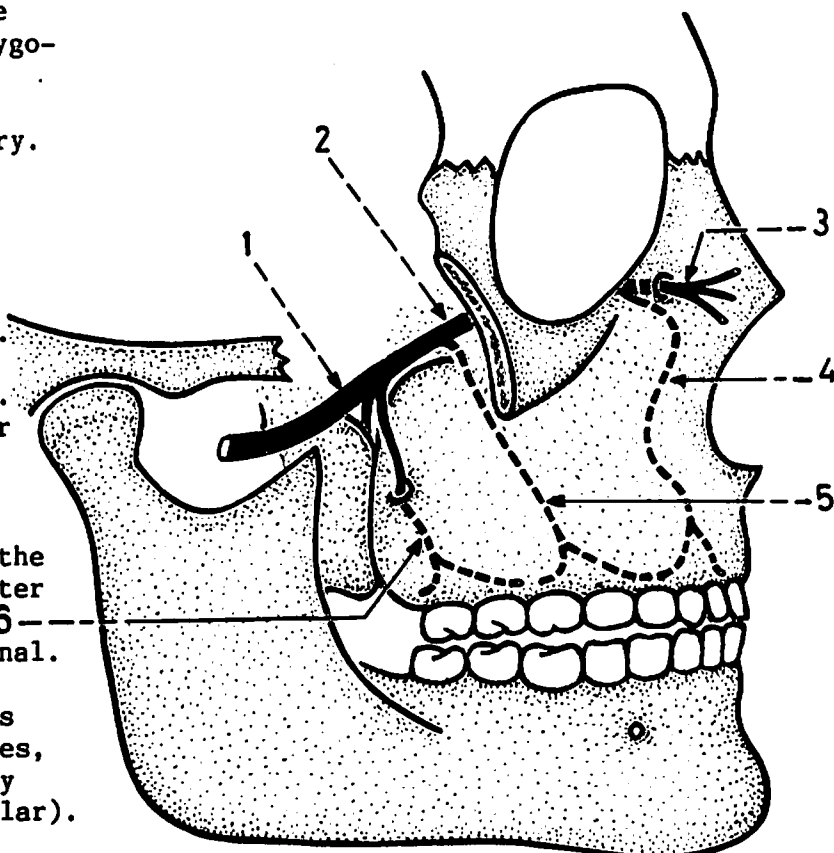




Fig.(195): 3rd PART OF MAXILLARY ARTERY  
IN THE PTERYGOPALATINE FOSSA

The artery enters the pterygopalatine fossa through the pterygomaxillary fissure. In the fossa it lies in close relation to the maxillary nerve and pterygopalatine ganglion.

1. maxillary nerve (it enters the fossa through the foramen rotundum).
2. pterygopalatine ganglion (suspended from the maxillary nerve).
3. 3rd part of maxillary artery in the pterygopalatine fossa.

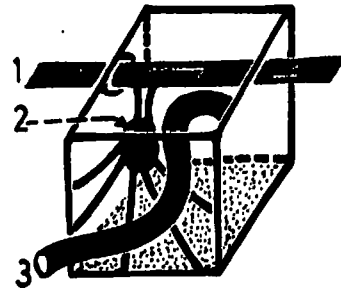


Fig.(196): ARROWS REPRESENTING BRANCHES  
OF 3rd PART OF MAXILLARY ARTERY

1. sphenopalatine artery (passes medially to the nose).
2. infraorbital artery (passes forwards to the floor of the orbit).
3. posterior superior alveolar artery (passes downwards and forwards on the back of the maxilla).
4. greater palatine artery (passes downwards in the greater palatine canal).
5. artery of pterygoid canal (passes backwards through the pterygoid canal to the upper part of the pharynx).

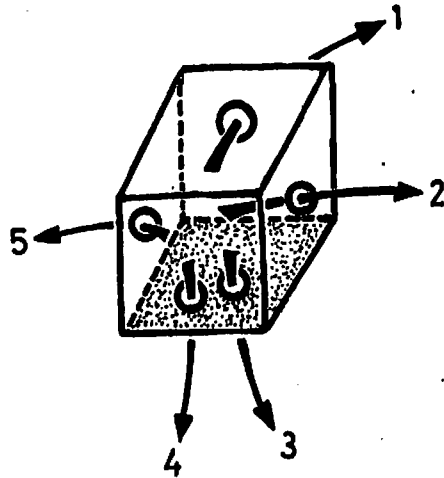


Fig.(197): GREATER PALATINE ARTERY

It is a branch of the 3rd part of maxillary artery which descends in the greater palatine canal. It emerges through the greater palatine foramen and runs forwards on the hard palate to enter the nasal cavity through the incisive canal.

1. greater palatine artery in the greater palatine canal.
2. lesser palatine branches.
3. greater palatine artery on the surface of the hard palate.
4. greater palatine artery in the incisive canal.

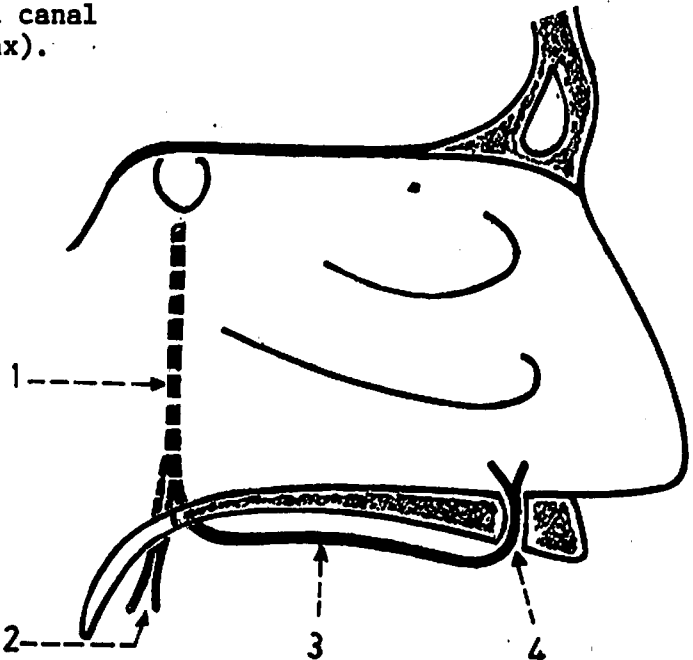
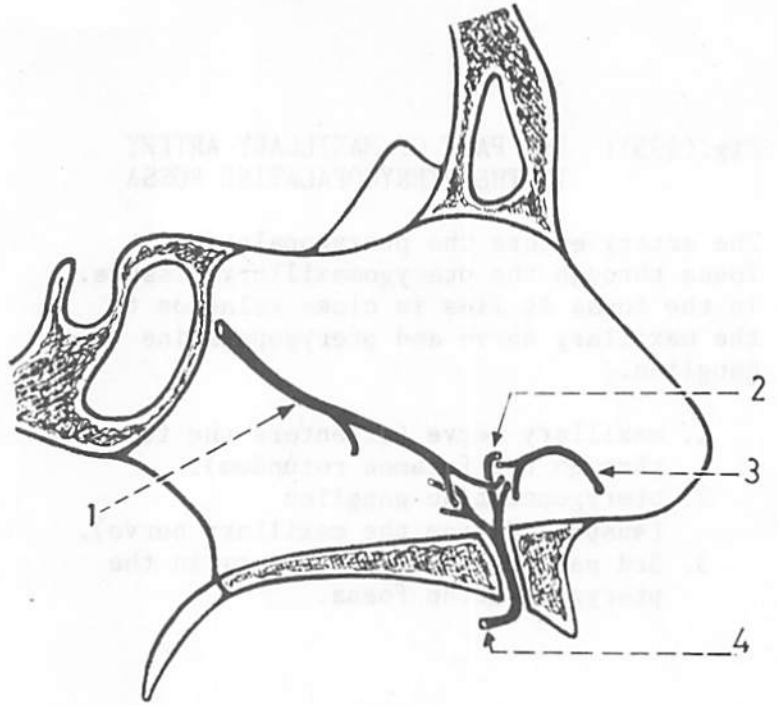


Fig.(198): SPHENOPALATINE ARTERY

It is a branch of the 3rd part of maxillary artery which enters the nasal cavity through the sphenopalatine foramen. It then runs forwards and downwards on the nasal septum as far as the incisive canal where it ends by anastomosing with the greater palatine artery and septal branch of facial artery.



1. sphenopalatine artery on the nasal septum.
2. anastomosis between 3 arteries (area of epistaxis).
3. septal branch of facial artery.
4. greater palatine artery.

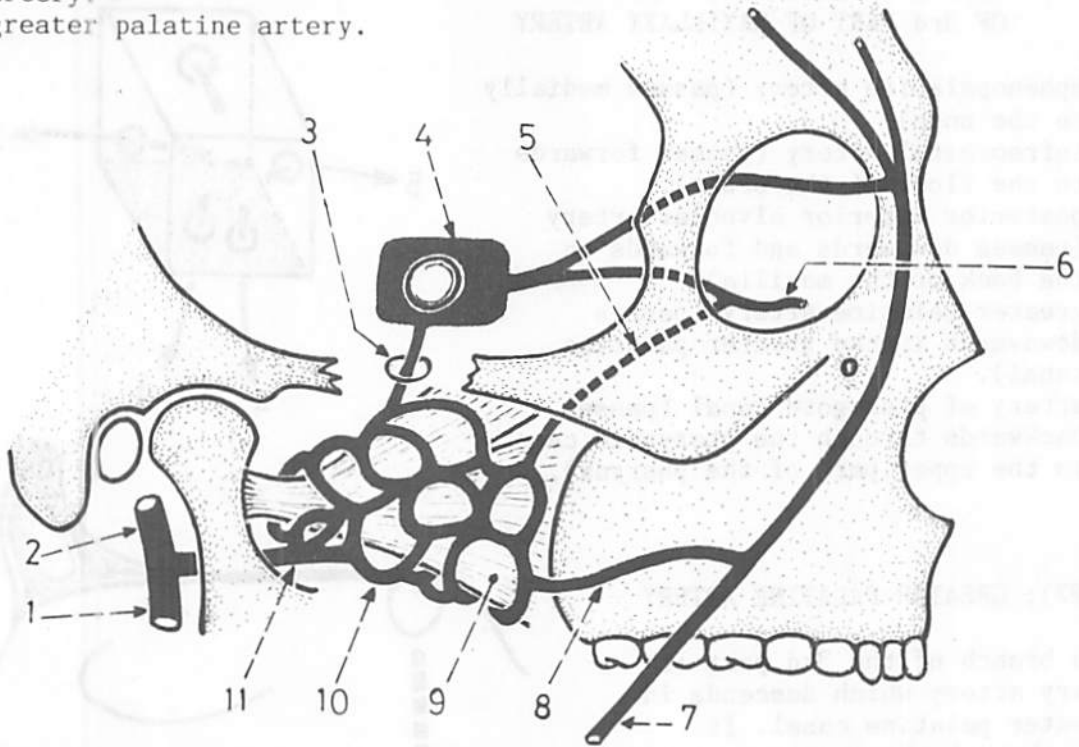


Fig.(199): PTERYGOID PLEXUS OF VEINS

It surrounds the lateral pterygoid muscle and receives the tributaries which accompany the maxillary artery. It leads to the maxillary vein.

- |   |  |
|---|--|
| 1. retromandibular vein.                            | 6. inferior ophthalmic vein.   |
| 2. superficial temporal vein.                       | 7. facial vein.  |
| 3. emissary vein passing through the foramen ovale. | 8. deep facial vein.   |
| 4. cavernous sinus.                                 | 9. lateral pterygoid muscle.   |
| 5. communication with the inferior ophthalmic vein. | 10. pterygoid plexus of veins.   |
|   | 11. maxillary vein (drains the pterygoid plexus and accompanies the 1st part of the artery). |

# MANDIBULAR NERVE AND OTIC GANGLION

Fig.(200): COURSE OF MANDIBULAR NERVE

The trunk of the mandibular nerve is formed just below the foramen ovale by union of a large sensory root and a smaller motor root. This trunk is very short and descends vertically in the infratemporal fossa between 2 muscles: tensor palati medially and lateral pterygoid laterally. It ends by dividing into anterior and posterior divisions.

1. motor root of trigeminal nerve (joins the mandibular nerve).
2. trigeminal ganglion.
3. tensor palati muscle (deep to the mandibular nerve).
4. auriculotemporal nerve surrounding the middle meningeal artery.
5. middle meningeal artery.
6. medial pterygoid.
7. foramen ovale.
8. trunk of mandibular nerve.

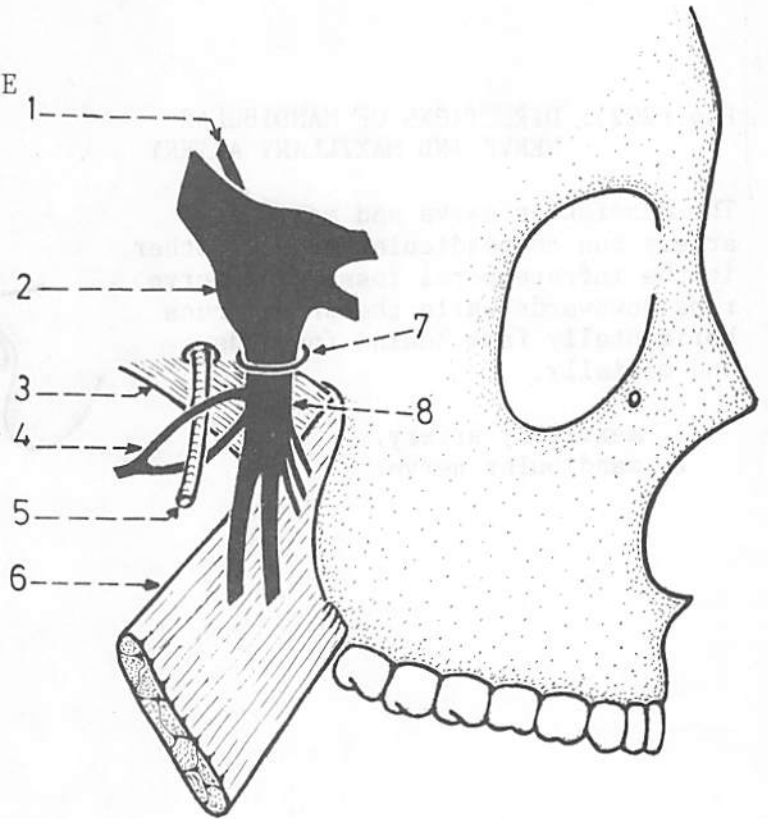
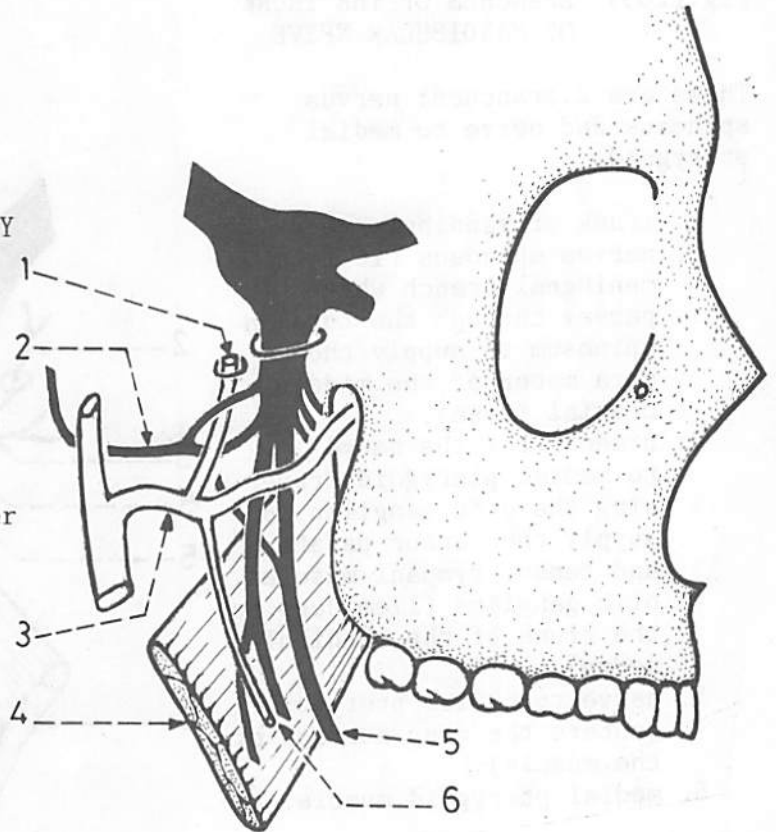


Fig.(201): RELATIONS OF MANDIBULAR NERVE TO MAXILLARY ARTERY

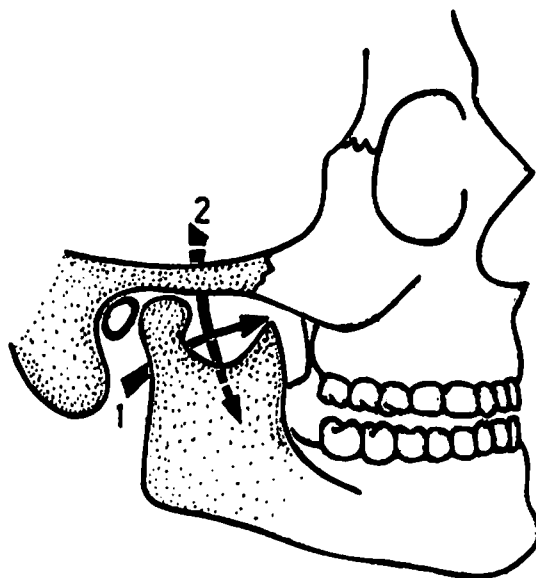
1. middle meningeal artery (ascends behind and parallel to the trunk of mandibular nerve).
2. auriculotemporal nerve (its 2 roots surround the middle meningeal artery).
3. maxillary artery (crosses over the posterior division of mandibular nerve).
4. medial pterygoid.
5. lingual nerve.
6. inferior alveolar nerve accompanied by inferior alveolar artery.



**Fig.(202): DIRECTIONS OF MANDIBULAR NERVE AND MAXILLARY ARTERY**

The mandibular nerve and maxillary artery run perpendicular to each other in the infratemporal fossa. The nerve runs downwards while the artery runs horizontally from behind forwards and medially.

1. maxillary artery.
2. mandibular nerve.



**Fig.(203): BRANCHES OF THE TRUNK OF MANDIBULAR NERVE**

These are 2 branches: nervus spinosus and nerve to medial pterygoid.

1. trunk of mandibular nerve.
2. nervus spinosus (it is a meningeal branch which passes through the foramen spinosum to supply the dura mater of the middle cranial fossa).
3. branch from the nerve to medial pterygoid traversing the otic ganglion to supply the tensor palati and tensor tympani muscles.
4. otic ganglion (lies deep to the trunk of the mandibular nerve).
5. nerve to medial pterygoid (enters the deep surface of the muscle).
6. medial pterygoid muscle.

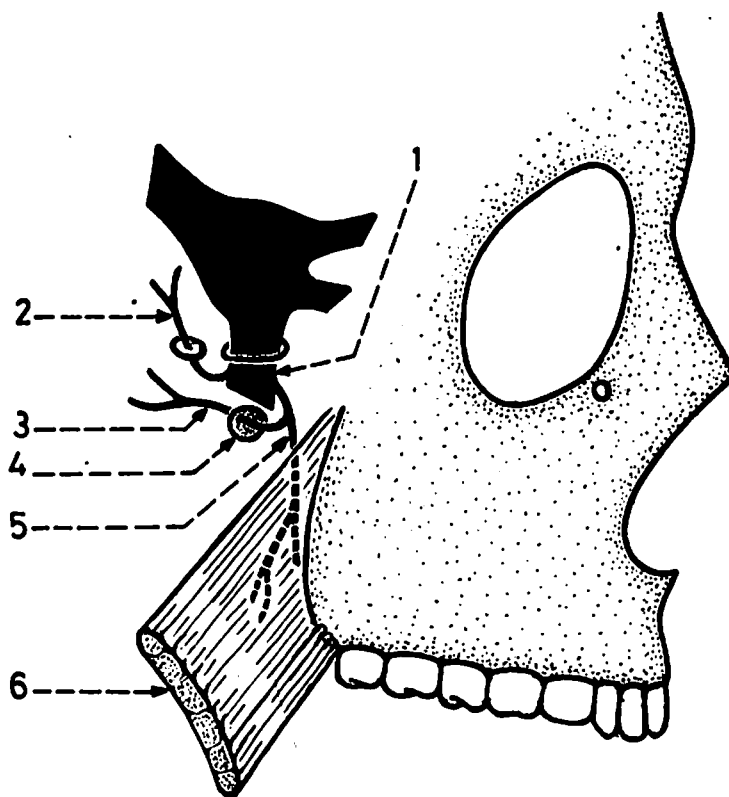
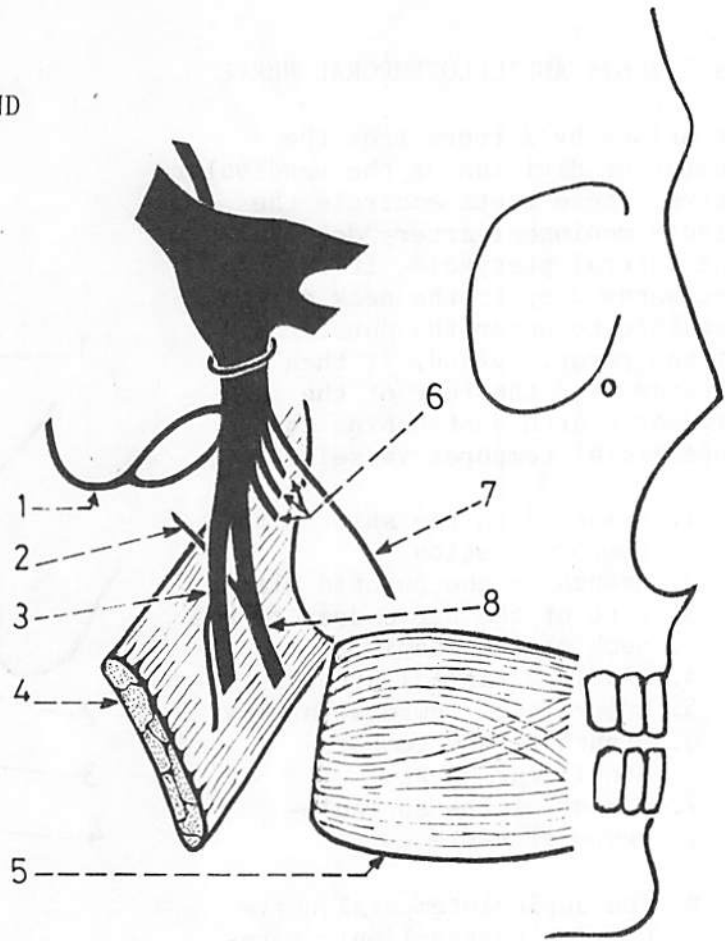


Fig.(204): BRANCHES OF ANTERIOR AND POSTERIOR DIVISIONS OF MANDIBULAR NERVE

The anterior division gives off the buccal nerve and branches to the lateral pterygoid, masseter and temporalis. The posterior division gives off the auriculotemporal, lingual and inferior alveolar nerves.

1. auriculotemporal nerve.
2. chorda tympani joining the lingual nerve at an acute angle.
3. inferior alveolar nerve.
4. medial pterygoid muscle.
5. buccinator muscle.
6. branches to the masseter, lateral pterygoid and temporalis.
7. buccal branch (to the skin over the buccinator).
8. lingual nerve.



- \* Most of the fibres of the anterior division are motor, while most of the fibres of the posterior division are sensory.

Fig.(205): BRANCHES OF ANTERIOR DIVISION

All are motor except the buccal nerve which is sensory.

1. deep temporal nerves to the temporalis.
2. upper head of lateral pterygoid.
3. nerve to masseter.
4. 3rd part of maxillary artery.
5. lower head of lateral pterygoid.
6. buccal nerve (passes between the 2 heads of lateral pterygoid).
7. buccinator.
8. superficial head of medial pterygoid.

- \* The nerve to lateral pterygoid is not shown in the figure because it enters the deep surface of the muscle.

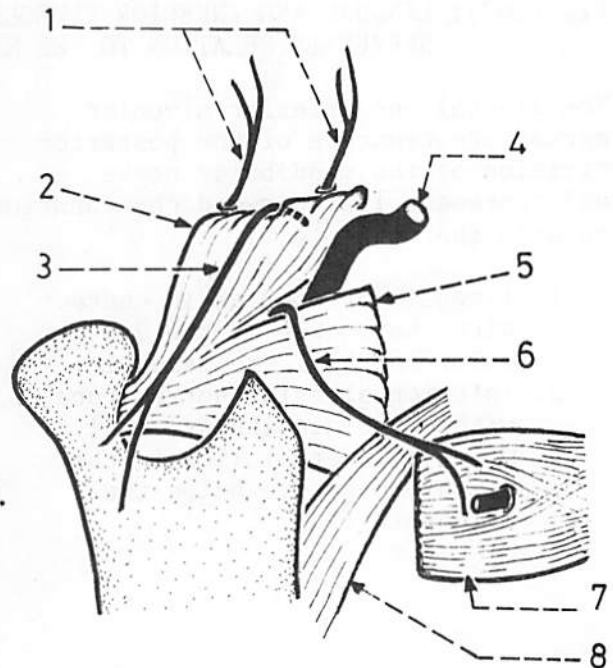


Fig.(206): AURICULOTEMPORAL NERVE

It arises by 2 roots from the posterior division of the mandibular nerve. These roots encircle the middle meningeal artery deep to the lateral pterygoid. It runs backwards deep to the neck of the mandible to enter the substance of the parotid gland. It then ascends over the root of the zygomatic arch just behind the superficial temporal vessels.

1. branches to the skin of the temporal region.
2. branch to the parotid gland.
3. part of the nerve deep to the neck of the mandible.
4. middle meningeal artery.
5. superficial temporal artery.
6. branch to the temporo-mandibular joint.
7. a root of the auriculo-temporal nerve.

\* The auriculotemporal nerve carries postganglionic parasympathetic fibres to the parotid gland.

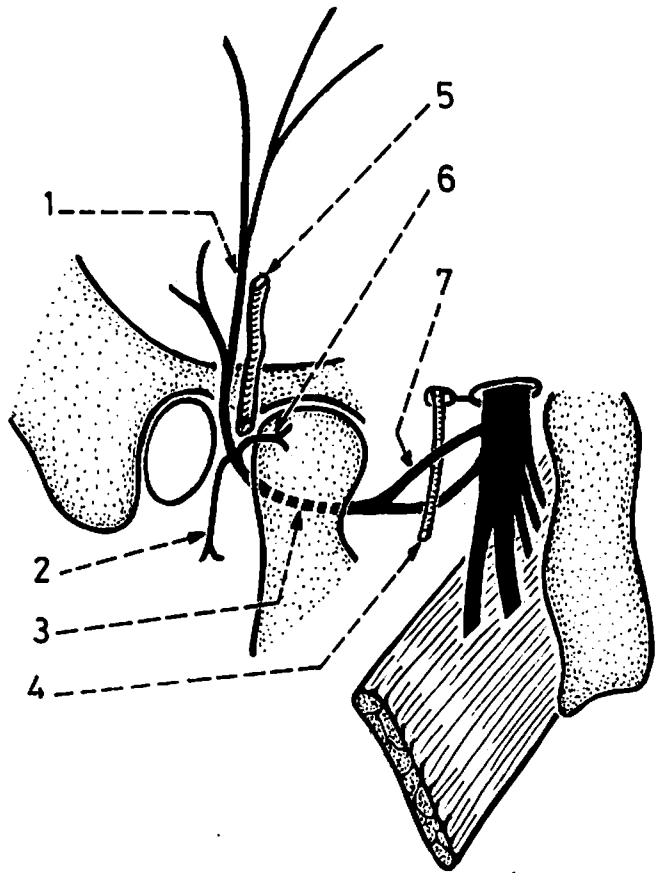


Fig.(207): LINGUAL AND INFERIOR ALVEOLAR NERVES IN RELATION TO THE MANDIBLE

The lingual and inferior alveolar nerves are branches of the posterior division of the mandibular nerve and represent its downward continuation towards the mandible.

1. lingual nerve: comes in contact with the socket of the 3rd molar tooth of the mandible.
2. inferior alveolar nerve: runs within the mandibular canal.
3. mylohyoid nerve: lies in the mylohyoid groove below the mylohyoid line.

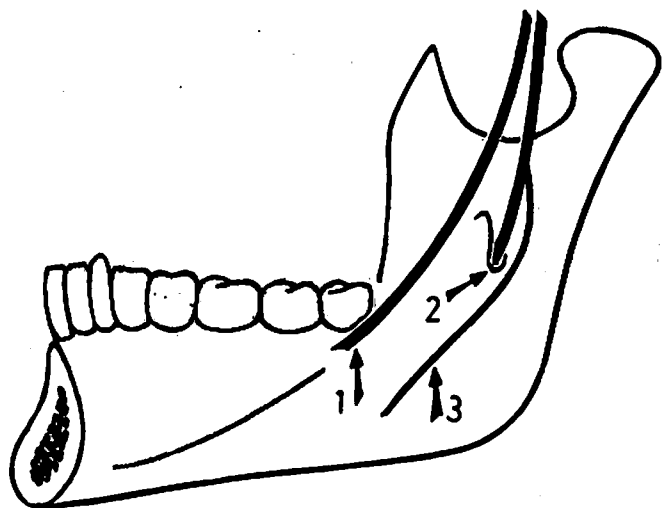
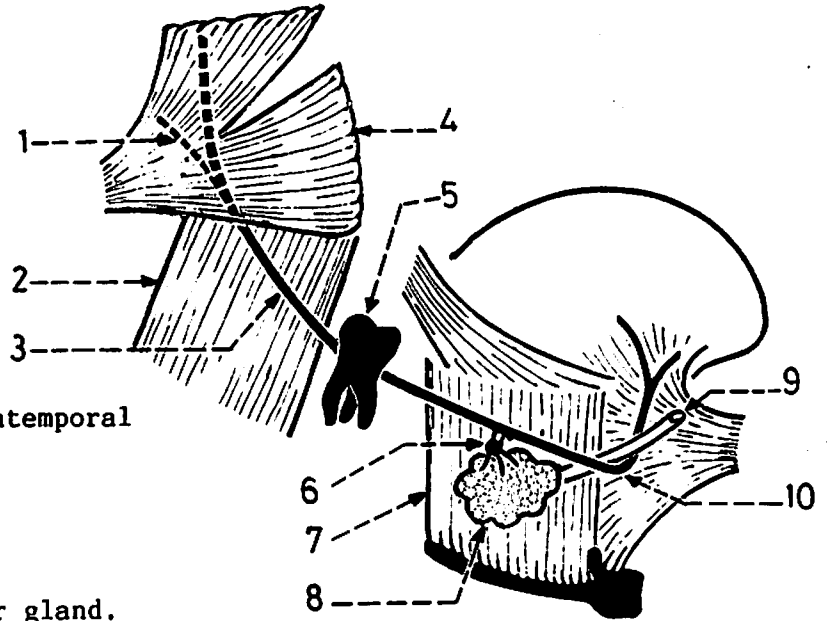


Fig.(208): LINGUAL NERVE

It has a long course in the infratemporal fossa, in the submandibular region and on the under surface of the tongue. It comes in direct contact with the socket of the 3rd molar tooth and here it is vulnerable to injury during extraction of the tooth.



1. chorda tympani joining the lingual nerve.
2. medial pterygoid.
3. lingual nerve in the infratemporal fossa.
4. lateral pterygoid.
5. 3rd molar tooth.
6. submandibular ganglion.
7. hyoglossus muscle.
8. deep part of submandibular gland.
9. submandibular duct.
10. lingual nerve in the submandibular region hooking round the submandibular duct.

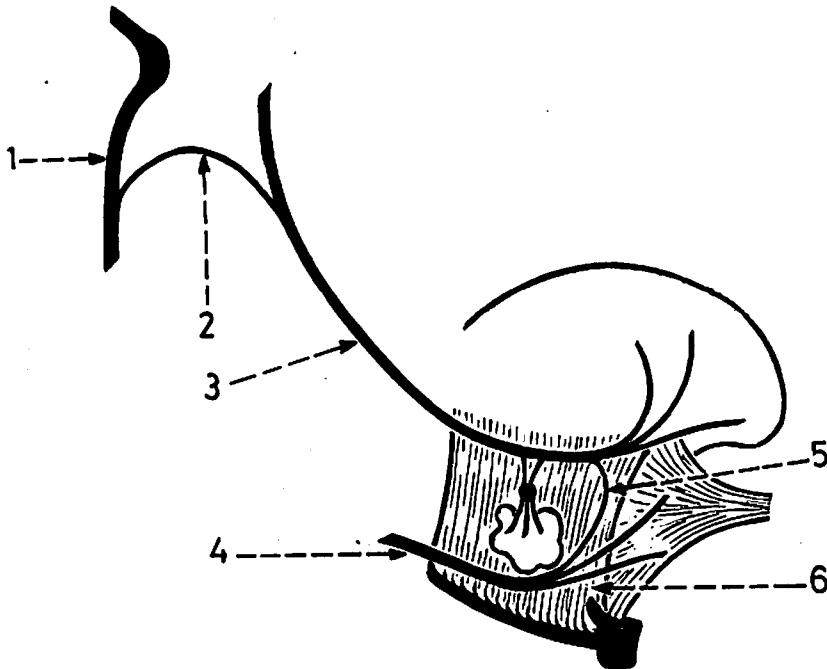


Fig.(209): CONNECTIONS OF LINGUAL NERVE

It is joined by the chorda tympani in the infratemporal fossa and connected with the hypoglossal nerve in the submandibular region.

- |   |  |
|---|--|
| 1. facial nerve.                                | 4. hypoglossal nerve.                        |
| 2. chorda tympani (branch of the facial nerve). | 5. communication with the hypoglossal nerve. |
| 3. lingual nerve.                               | 6. hyoglossus muscle.                        |



Fig.(210): TYPES OF FIBRES IN THE LINGUAL NERVE

The lingual nerve contains sensory fibres and gets additional taste and parasympathetic fibres from the chorda tympani.

1. nucleus solitarius (receives taste fibres).
2. superior salivary nucleus (parasympathetic secretomotor).
3. geniculate ganglion.
4. chorda tympani (contains taste and parasympathetic fibres, and joins the lingual nerve in the infratemporal fossa).
5. preganglionic parasympathetic fibres.
6. submandibular ganglion.
7. submandibular gland.
8. sublingual gland.
9. anterior 2/3 of the tongue.
10. taste fibres from anterior 2/3 of the tongue.
11. lingual nerve.

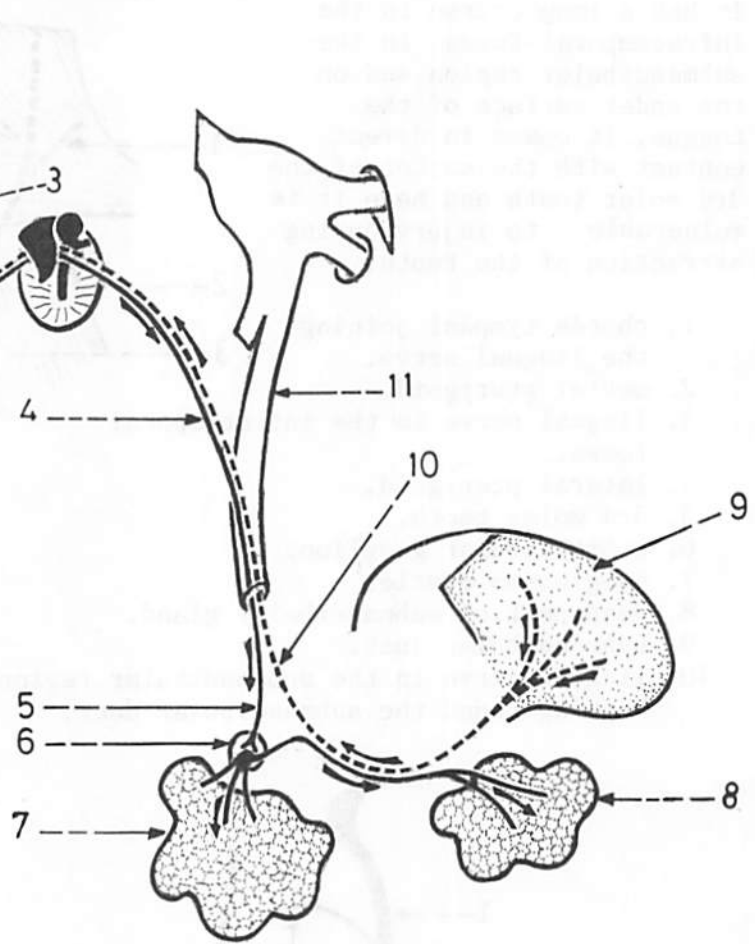


Fig.(211): DISTRIBUTION OF THE LINGUAL NERVE

It is sensory to the mucous membrane of the anterior 2/3 of the tongue, floor of the mouth and gums of the lower teeth. It also supplies taste fibres to the anterior 2/3 of the tongue and parasympathetic fibres to the submandibular and sublingual glands (through the chorda tympani).

1. anterior 2/3 of the tongue.
2. gums of lower teeth.
3. mucous membrane of the floor of the mouth.
4. sublingual gland.
5. submandibular gland.

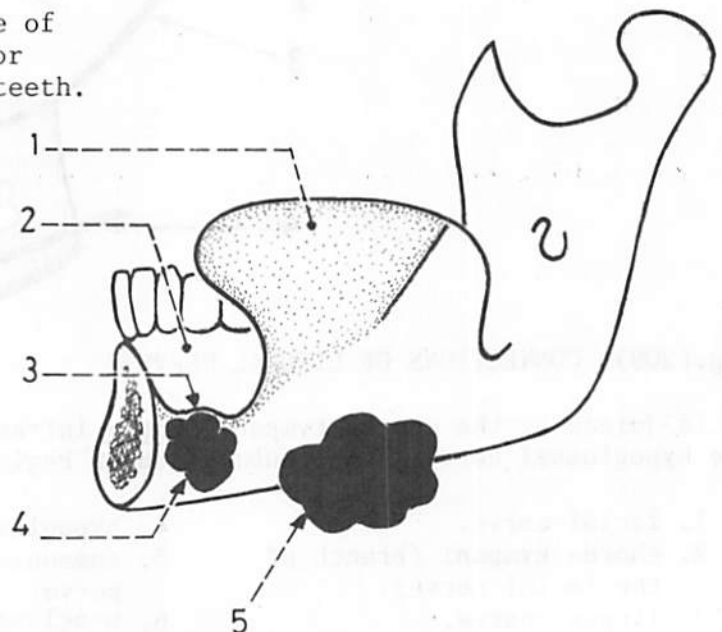




Fig.(212): INFERIOR ALVEOLAR NERVE

It arises from the posterior division of the mandibular nerve and descends behind the lingual nerve to enter the mandibular canal. It ends by dividing into mental and incisive branches. Just before it enters the mandibular canal it gives off the mylohyoid nerve which supplies the mylohyoid and anterior belly of digastric.

1. inferior alveolar nerve.
2. mylohyoid nerve (contains all the motor fibres which pass in the posterior division of the mandibular nerve).
3. mylohyoid muscle.
4. anterior belly of digastric.
5. incisive branch (supplies the canine and incisor teeth).
6. mental branch (emerges through the mental foramen to supply the skin over the chin).
7. mandibular foramen.

\* The inferior alveolar nerve supplies all the teeth of the mandible.

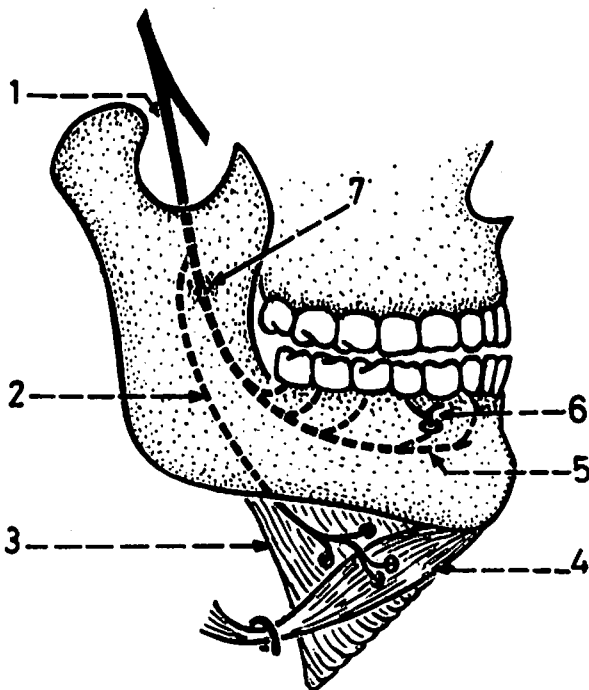


Fig.(213): OTIC GANGLION

It is a parasympathetic ganglion which lies deep to the trunk of the mandibular nerve between it and the tensor palati muscle.

1. otic ganglion.
2. tensor palati muscle.
3. trunk of mandibular nerve.

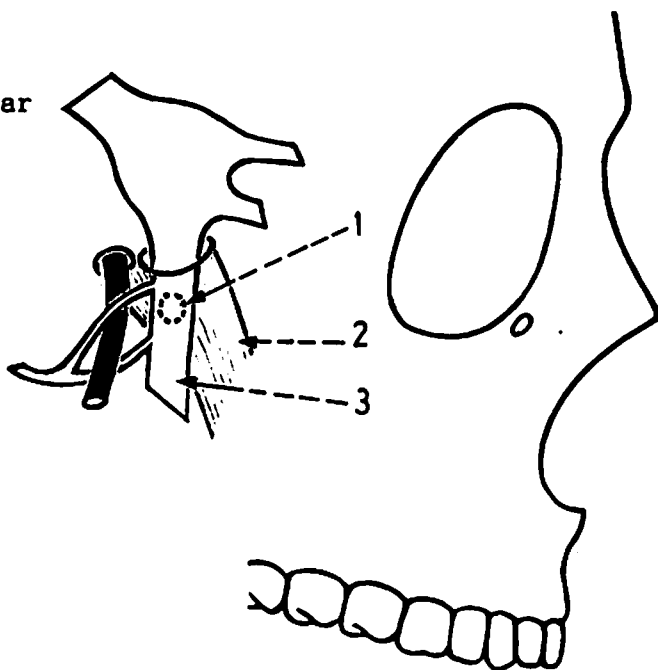


Fig.(214): ROOTS OF OTIC GANGLION

It has a parasympathetic root which consists of preganglionic fibres from the lesser petrosal nerve, and a sympathetic root derived from the plexus around the middle meningeal artery. The ganglion is traversed by a branch from the nerve to medial pterygoid on its way to supply the tensor palati and tensor tympani.

1. parasympathetic root (relays in the ganglion).
2. sympathetic root (does not relay in the ganglion).
3. branch to tensor palati and tensor tympani traversing the ganglion.

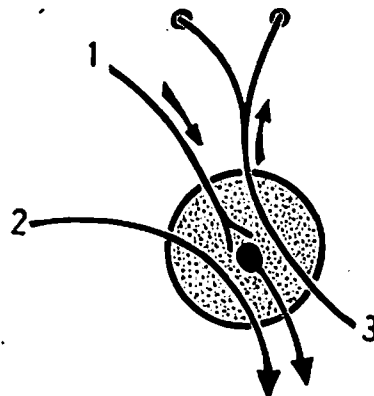


Fig.(215): PREGANGLIONIC AND POSTGANGLIONIC FIBRES OF OTIC GANGLION

The preganglionic fibres arise in the inferior salivary nucleus of the glossopharyngeal nerve and relay in the otic ganglion. The postganglionic fibres reach the parotid gland.

1. glossopharyngeal nerve.
2. tympanic branch of glossopharyngeal nerve carrying parasympathetic fibres.
3. tympanic plexus in the middle ear.
4. lesser petrosal nerve.
5. foramen ovale.
6. otic ganglion.
7. postganglionic fibres.
8. auriculotemporal nerve.
9. fibres to parotid gland.

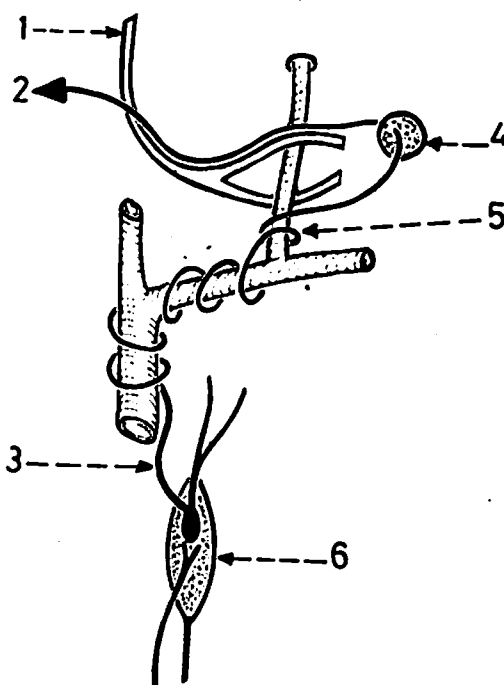
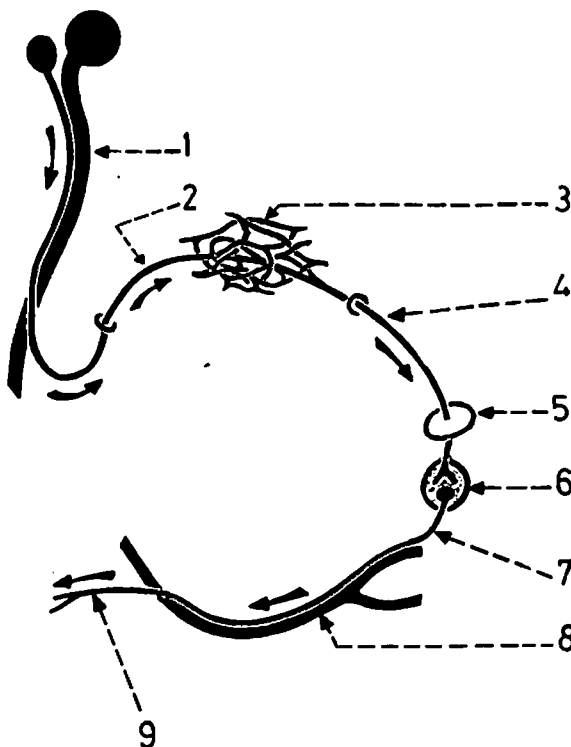


Fig.(216): SYMPATHETIC ROOT OF OTIC GANGLION

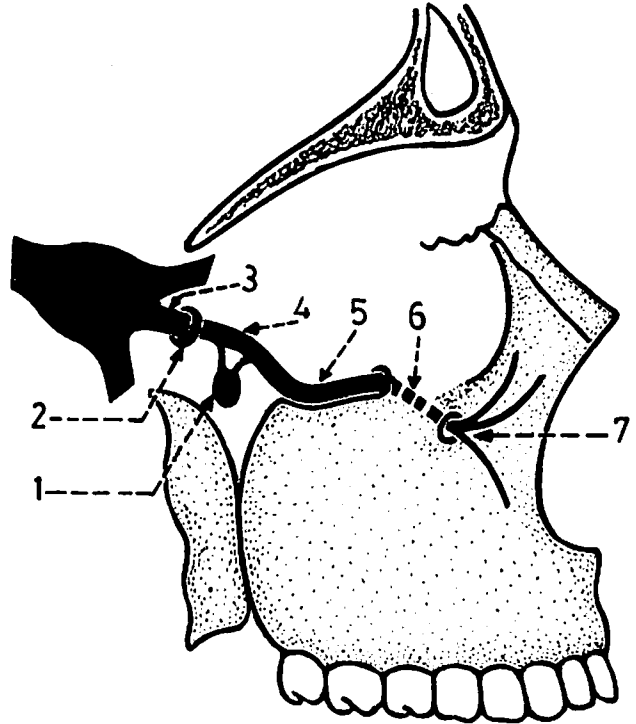
It arises in the superior cervical sympathetic ganglion.

1. auriculotemporal nerve.
2. sympathetic fibres to parotid gland.
3. postganglionic sympathetic fibres.
4. otic ganglion.
5. plexus around middle meningeal artery.
6. superior cervical sympathetic ganglion.

MAXILLARY NERVE AND PTERYGOPALATINE GANGLION

Fig.(217): COURSE OF MAXILLARY NERVE

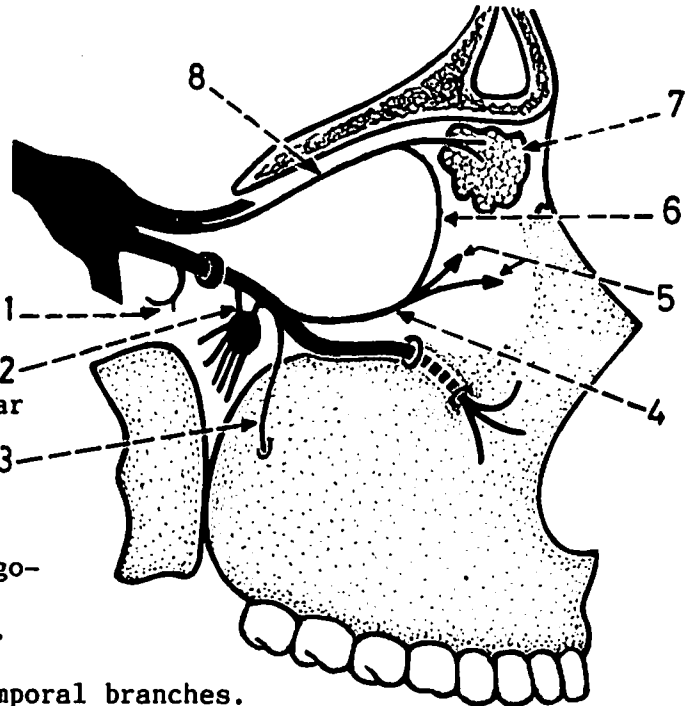
It arises from the trigeminal ganglion in the middle cranial fossa. It leaves the skull through the foramen rotundum to enter the pterygopalatine fossa. It leaves the fossa through the inferior orbital fissure to enter the infraorbital groove and canal in the floor of the orbit, where it is called the infraorbital nerve. It appears on the face through the infraorbital foramen.



1. pterygopalatine ganglion in the pterygopalatine fossa.
2. foramen rotundum.
3. part of the nerve in the middle cranial fossa arising from the trigeminal ganglion.
4. part of the nerve in the pterygopalatine fossa.
5. infraorbital nerve in the infraorbital groove (it is the continuation of the maxillary nerve).
6. infraorbital nerve in the infraorbital canal.
7. termination of the infraorbital nerve emerging through the infraorbital foramen.

Fig.(218): BRANCHES OF MAXILLARY NERVE

These are the meningeal, ganglionic, zygomatic and posterior superior alveolar in addition to the infraorbital nerve.



1. meningeal branch (in the middle cranial fossa).
2. ganglionic branches for the pterygopalatine ganglion.
3. posterior superior alveolar nerve.
4. zygomatic nerve.
5. zygomaticofacial and zygomaticotemporal branches.
6. communication between zygomatic and lacrimal nerves.
7. lacrimal gland.
8. lacrimal branch of ophthalmic nerve.

Fig.(219): INFRAORBITAL NERVE AND ITS BRANCHES

It is the continuation of the maxillary nerve in the floor of the orbit. It gives off the middle and anterior superior alveolar nerves and ends on the face by dividing into palpebral, nasal and labial branches.

1. ganglionic branches of maxillary nerve.
2. posterior superior alveolar nerve (from the maxillary nerve in the pterygopalatine fossa to supply the molar teeth).
3. middle superior alveolar nerve (from the infraorbital nerve to the premolar teeth).
4. infraorbital nerve in the floor of the orbit.
5. terminal branches of infraorbital nerve (palpebral, nasal and labial).
6. anterior superior alveolar nerve (from the infraorbital nerve to the canine and incisor teeth).

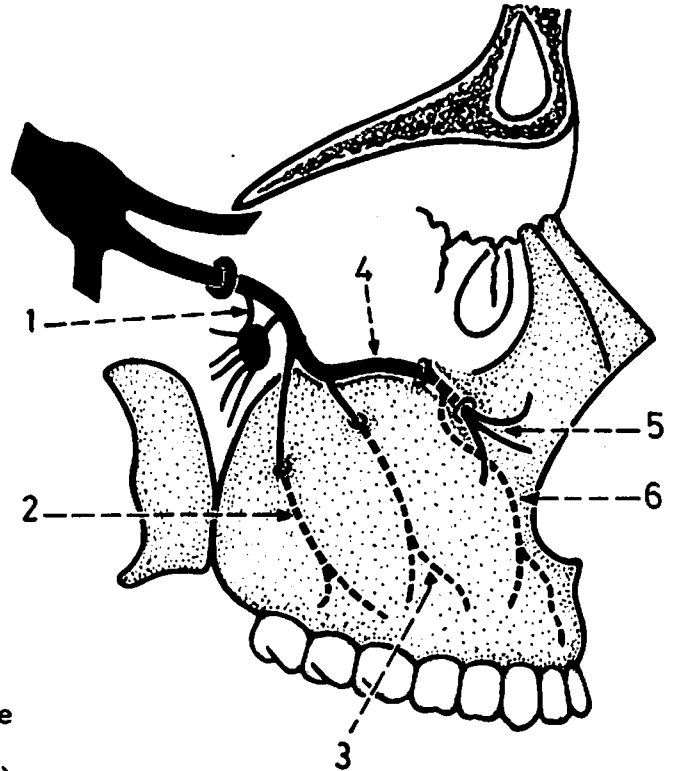


Fig.(220): INFRAORBITAL AND ZYGOMATIC NERVES AS THEY ENTER THE FLOOR OF THE ORBIT

These 2 nerves which arise from the maxillary nerve in the pterygopalatine fossa enter the orbit through the inferior orbital fissure.

1. zygomatic nerve.
2. infraorbital nerve.
3. infraorbital artery accompanying the infraorbital nerve.
4. maxillary nerve in the pterygopalatine fossa.

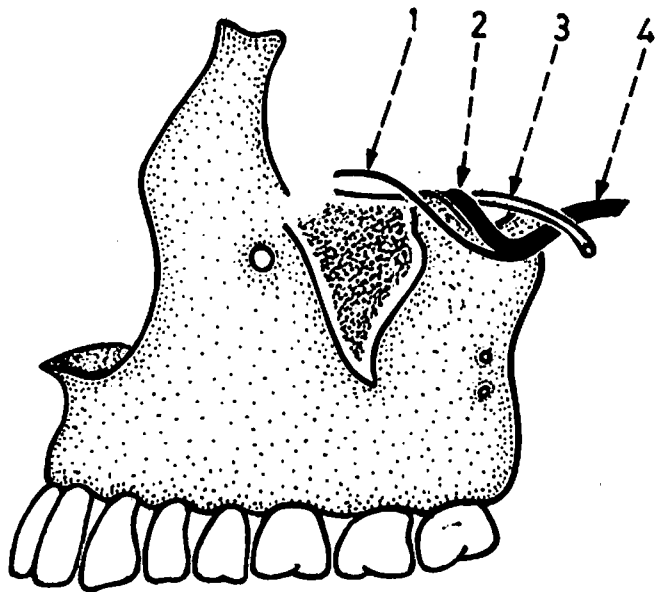


Fig.(221): POSITION OF PTERYGOPALATINE GANGLION

It is a parasympathetic ganglion which lies in the pterygopalatine fossa. It is suspended from the maxillary nerve by 2 ganglionic branches.

1. pterygopalatine (sphenopalatine) ganglion.
2. nerve of pterygoid canal.
3. maxillary nerve in the pterygopalatine fossa.

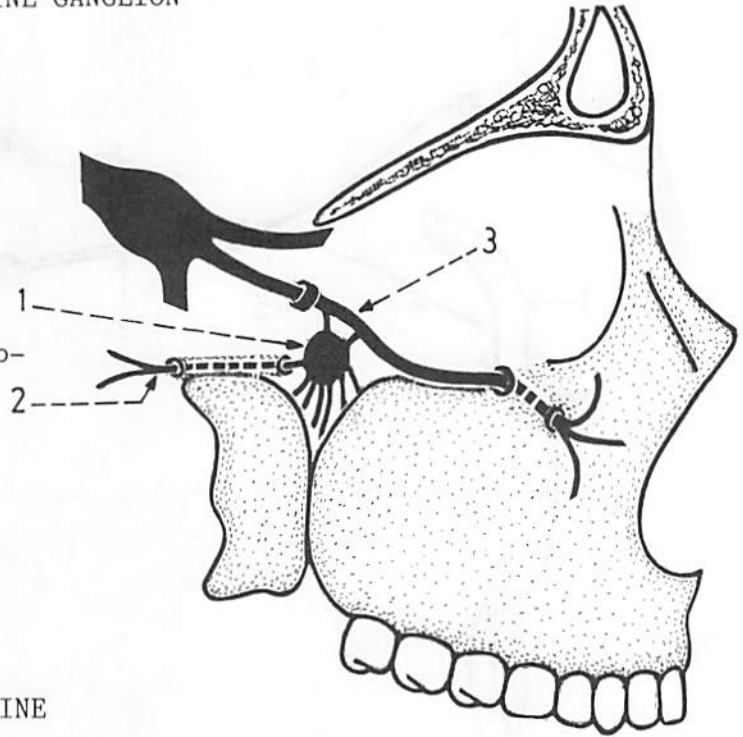
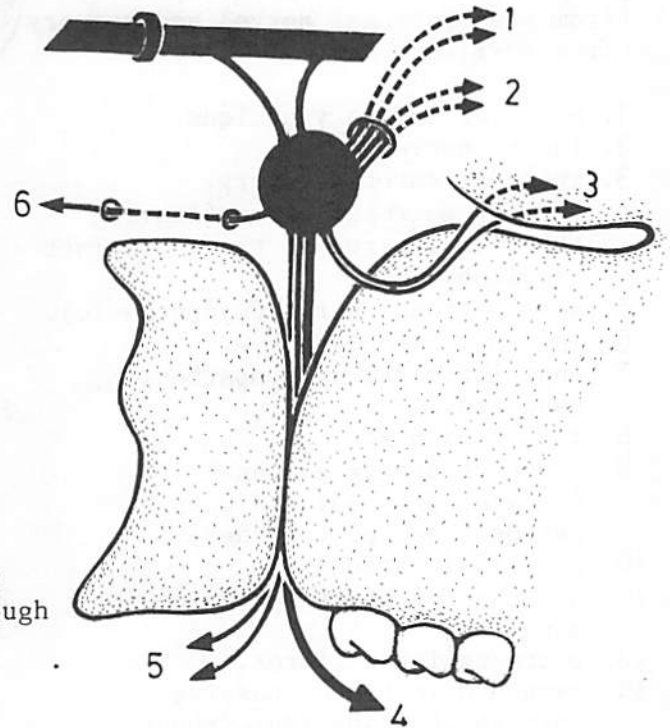


Fig.(222): BRANCHES OF PTERYGOPALATINE GANGLION

These are orbital, nasopalatine, greater palatine, lesser palatine, nasal and pharyngeal branches.

1. nasopalatine and medial nasal branches (to the nasal septum).
2. lateral nasal branches (to the lateral wall of the nose).
3. orbital branches (pass through the inferior orbital fissure to the periosteum of the orbit).
4. greater palatine nerve (descends through the greater palatine canal).
5. lesser palatine nerves (descend through the greater palatine canal and emerge through the lesser palatine foramina).
6. pharyngeal branch (passes backwards through the palatino-vaginal canal to reach the nasopharynx).



\* Note that the nasal and nasopalatine branches enter the nasal cavity through the sphenopalatine foramen present in the medial wall of the pterygopalatine fossa.

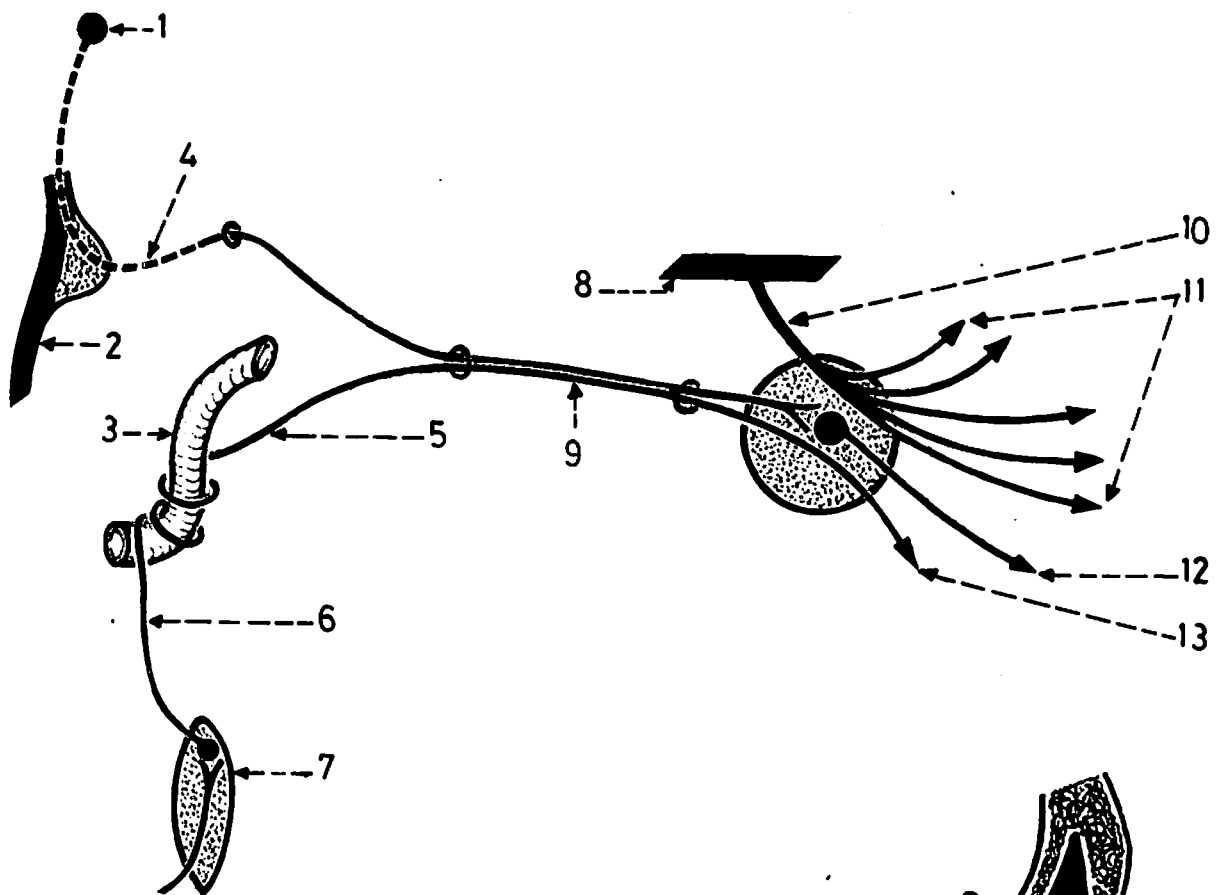


Fig.(223): ROOTS OF PTERYGOPALATINE GANGLION

It has 3 roots: parasympathetic (from greater petrosal nerve), sympathetic (from deep petrosal nerve) and sensory (from maxillary nerve).

1. superior salivary nucleus.
2. facial nerve.
3. internal carotid artery.
4. greater petrosal nerve (leaving the facial nerve at the geniculate ganglion).
5. deep petrosal nerve (sympathetic).
6. internal carotid nerve.
7. superior cervical sympathetic ganglion.
8. maxillary nerve.
9. nerve of pterygoid canal (greater petrosal and deep petrosal nerves together).
10. ganglionic branch.
11. branches of pterygopalatine ganglion.
12. postganglionic fibres.
13. sympathetic fibres passing through the ganglion without interruption.

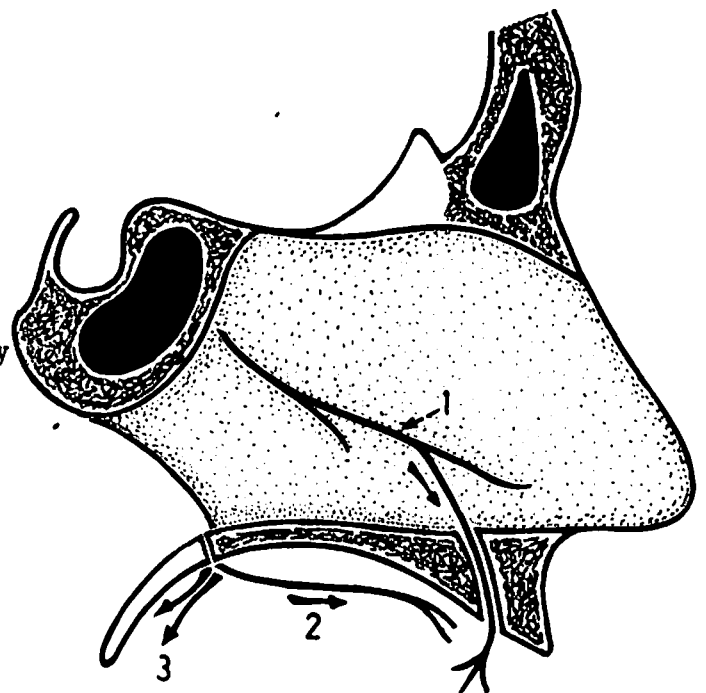


Fig.(224): NASOPALATINE, GREATER PALATINE AND LESSER PALATINE NERVES

1. nasopalatine nerve (runs on the nasal septum and passes through the incisive canal to reach the hard palate).
2. greater palatine nerve (to hard palate).
3. lesser palatine nerves (to soft palate).

# TEMPOROMANDIBULAR JOINT

Fig.(225): ARTICULATING SURFACES

The temporomandibular joint (TMJ) is a condylar joint between the articular tubercle (eminence) and mandibular fossa above, and the head of the mandible below. Its cavity is divided into upper and lower compartments by an articular disc.

1. mandibular fossa.
2. head of the mandible.
3. articular tubercle (eminence).
4. articular disc.

\* The mandibular fossa and articular tubercle belong to the squamous part of temporal bone.

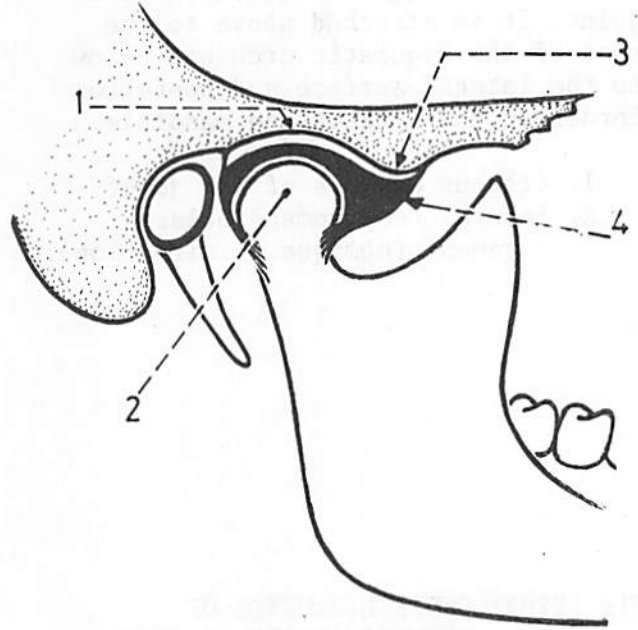


Fig.(226): FIBROUS CAPSULE AND ARTICULAR DISC

The fibrous capsule is attached above to the articular tubercle, circumference of the mandibular fossa and lips of the squamotympanic fissure, and is attached below to the neck of the mandible. The articular disc is attached by its circumference to the fibrous capsule. Its upper surface is concavoconvex while its lower surface is concave.

1. upper compartment of the joint.
2. synovial membrane.
3. lower compartment of the joint.
4. articular tubercle.
5. articular disc (a plate of fibrocartilage).
6. synovial membrane.
7. fibrous capsule.

\* The 2 compartments of the joint are completely separated from each other by the articular disc.

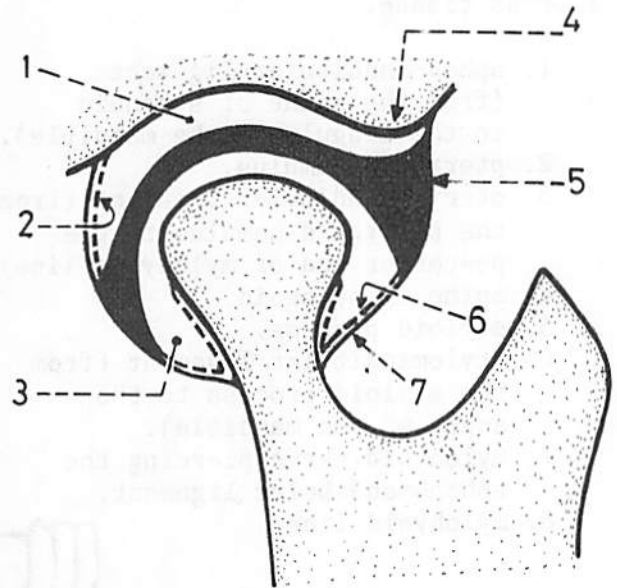


Fig.(227): LATERAL TEMPOROMANDIBULAR LIGAMENT

It is the strongest ligament of the joint. It is attached above to the root of the zygomatic arch and below to the lateral surface and posterior border of the neck of the mandible.

1. fibrous capsule of the joint.
2. lateral temporomandibular ligament (oblique in direction).

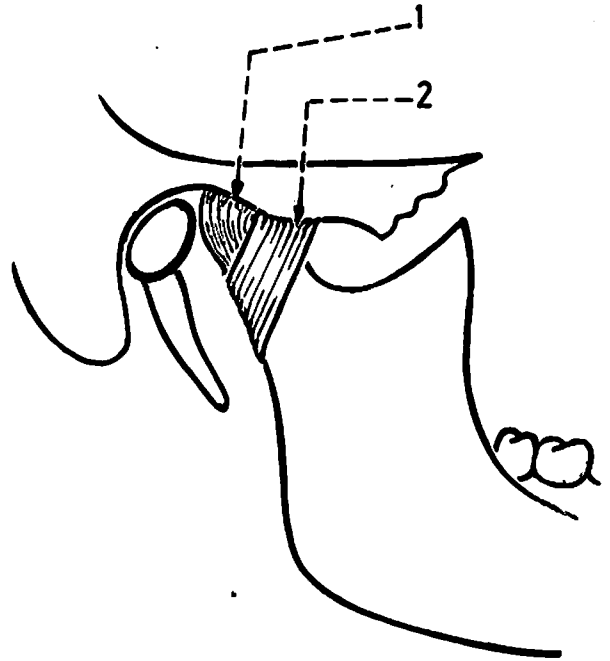


Fig.(228): OTHER LIGAMENTS OF TEMPOROMANDIBULAR JOINT

These are the pterygomandibular, sphenomandibular and stylomandibular ligaments. They are weak bands of fibrous tissue.

1. sphenomandibular ligament (from the spine of sphenoid to the lingula of the mandible).
2. pterygoid hamulus.
3. pterygomandibular ligament (from the pterygoid hamulus to the posterior end of mylohyoid line).
4. spine of sphenoid.
5. styloid process.
6. stylomandibular ligament (from the styloid process to the angle of the mandible).
7. mylohyoid nerve piercing the sphenomandibular ligament.
8. mylohyoid line.

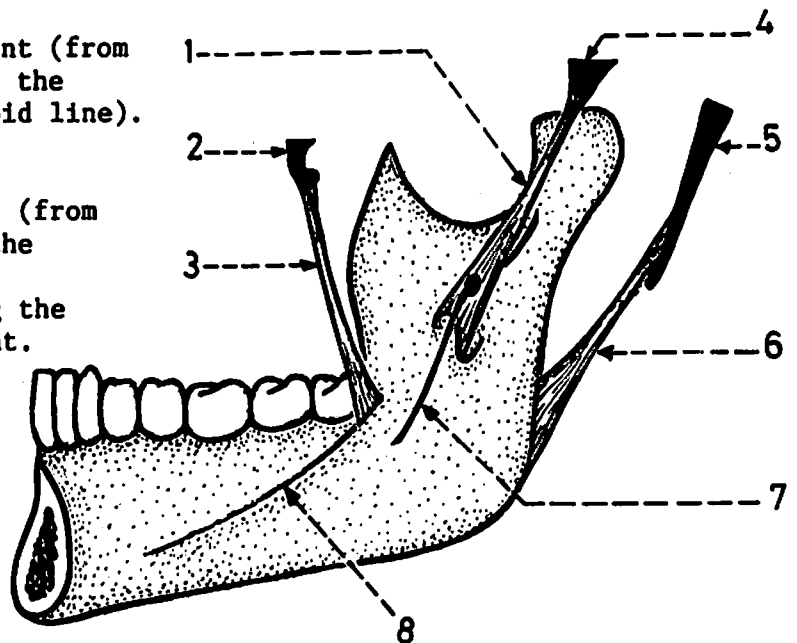




Fig.(229): PTERYGOMANDIBULAR AND STYLOMANDIBULAR LIGAMENTS

The pterygomandibular ligament gives attachment to 2 muscles: buccinator in front and superior constrictor of the pharynx behind.  
The stylomandibular ligament intervenes between 2 glands: submandibular in front and parotid behind.

1. superior constrictor muscle of the pharynx.
2. pterygomandibular ligament.
3. buccinator.
4. submandibular gland.
5. stylomandibular ligament.
6. parotid gland.

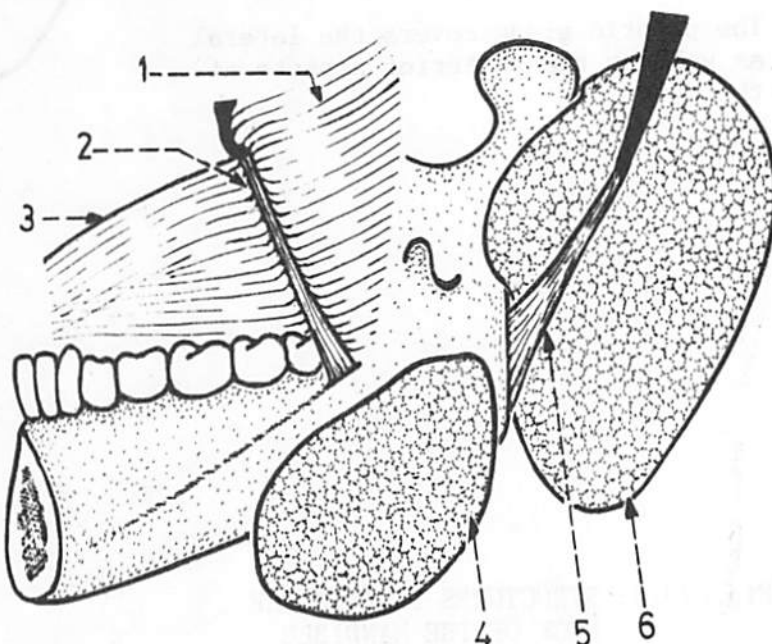
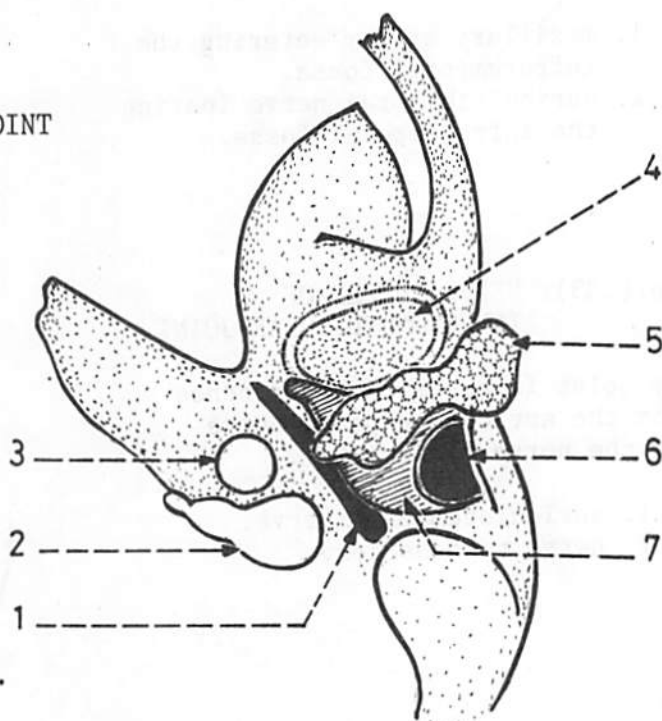


Fig.(230): RELATION OF THE PAROTID GLAND TO THE BACK OF THE JOINT

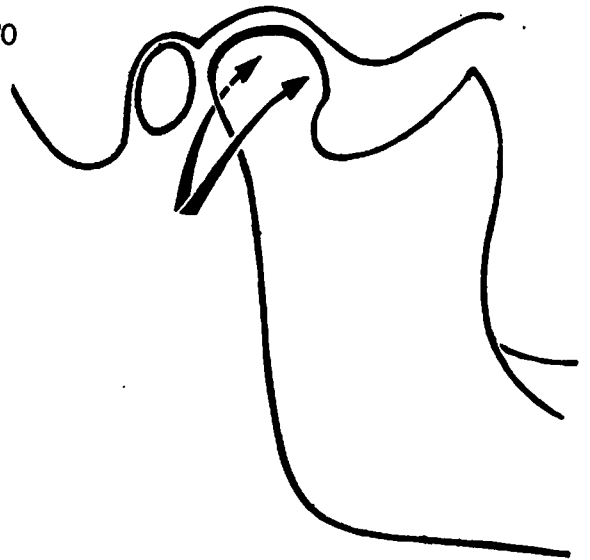
The parotid gland extends deeply behind the joint between it and the external acoustic meatus to reach the styloid process.

1. styloid process.
2. jugular foramen.
3. carotid foramen.
4. mandibular fossa (for the temporomandibular joint).
5. part of the parotid gland between the joint in front and the external acoustic meatus behind.
6. external acoustic meatus.
7. tympanic plate of temporal bone.



**Fig.(231): RELATIONS OF THE PAROTID GLAND TO THE TEMPOROMANDIBULAR JOINT**

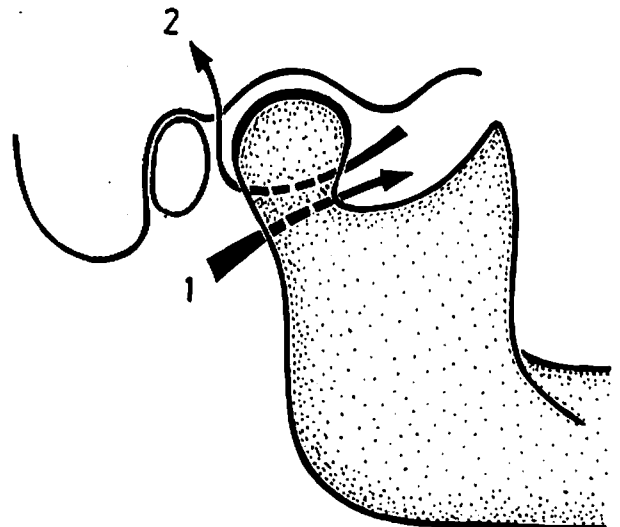
The parotid gland covers the lateral as well as the posterior aspects of the joint.



**Fig.(232): STRUCTURES DEEP TO THE NECK OF THE MANDIBLE**

These are the auriculotemporal nerve and maxillary vessels.

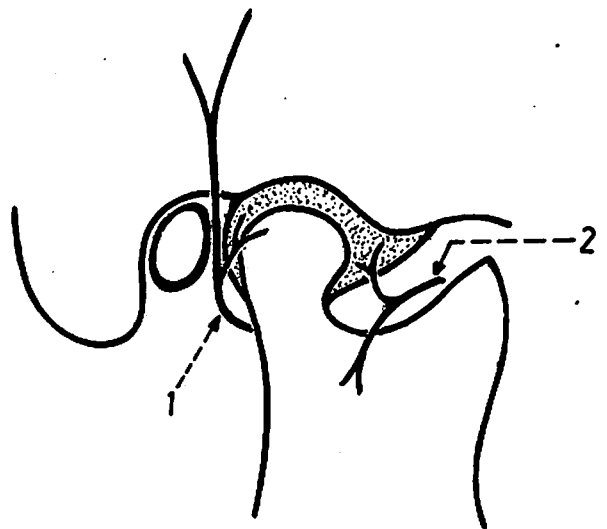
1. maxillary artery entering the infratemporal fossa.
2. auriculotemporal nerve leaving the infratemporal fossa.



**Fig.(233): NERVE SUPPLY OF TEMPOROMANDIBULAR JOINT**

The joint is supplied by branches from the auriculotemporal nerve and the nerve to masseter.

1. auriculotemporal nerve.
2. nerve to masseter.



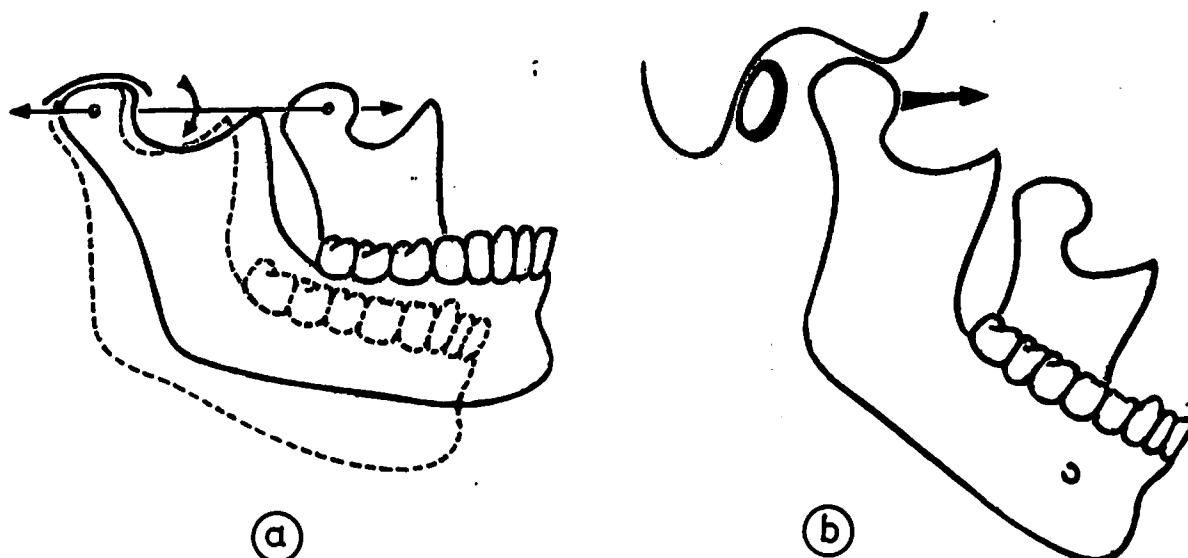


Fig.(234): OPENING OF THE MOUTH

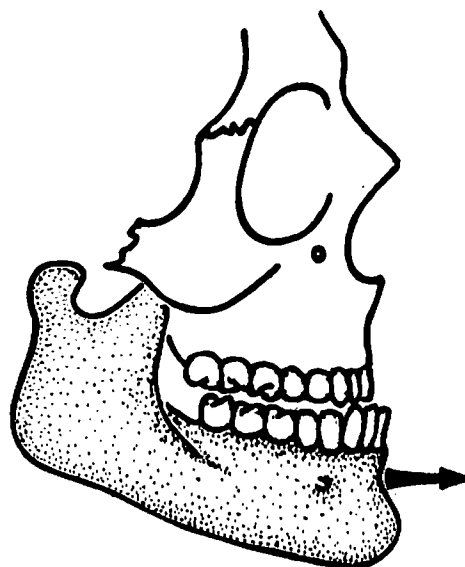
Two movements take place at the temporomandibular joint when the mouth is opened. The 1st movement is rotation of the head of the mandible around a horizontal axis; it takes place in the lower compartment of the joint. The 2nd movement is forward gliding of the head of the mandible together with the articular disc over the articular eminence; it takes place in the upper compartment of the joint.

(a) Rotation of the head of the mandible around a horizontal axis.

(b) Forward gliding of the head of the mandible over the articular eminence.

Fig.(235): PROTRUSION OF THE MANDIBLE

In this movement the lower incisors are drawn forwards in front of the upper incisors. It takes place by the lateral pterygoid muscles of both sides (mainly) as well as by the medial pterygoid and masseter muscles of both sides.



# CRANIAL CAVITY

Fig.(236): ARTERIES WITHIN THE CRANIAL CAVITY

1. internal carotid artery (on the side of the body of sphenoid).
2. middle meningeal artery (on the floor of the middle cranial fossa)
3. vertebral artery (in the posterior cranial fossa).

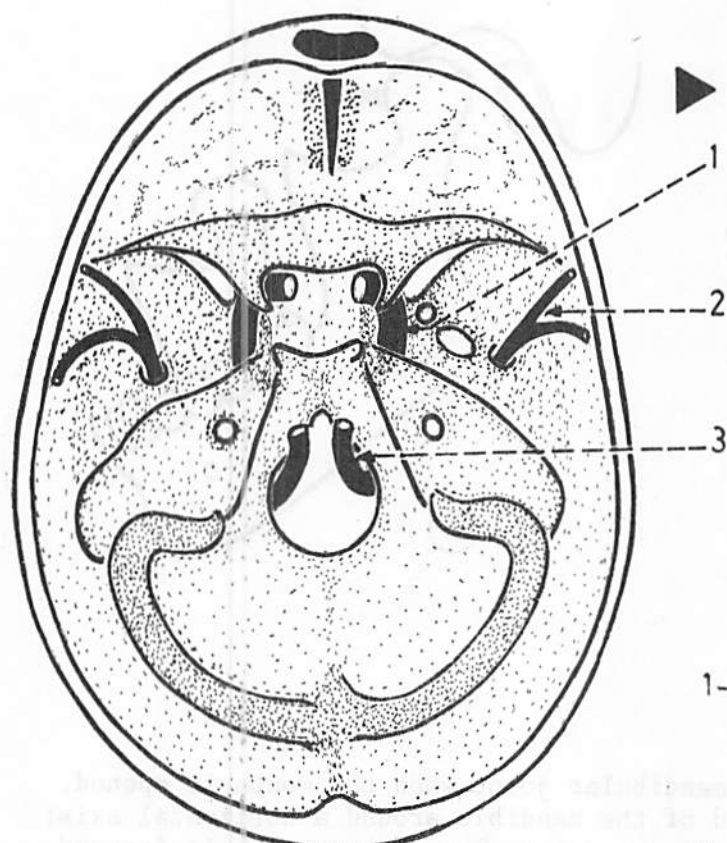
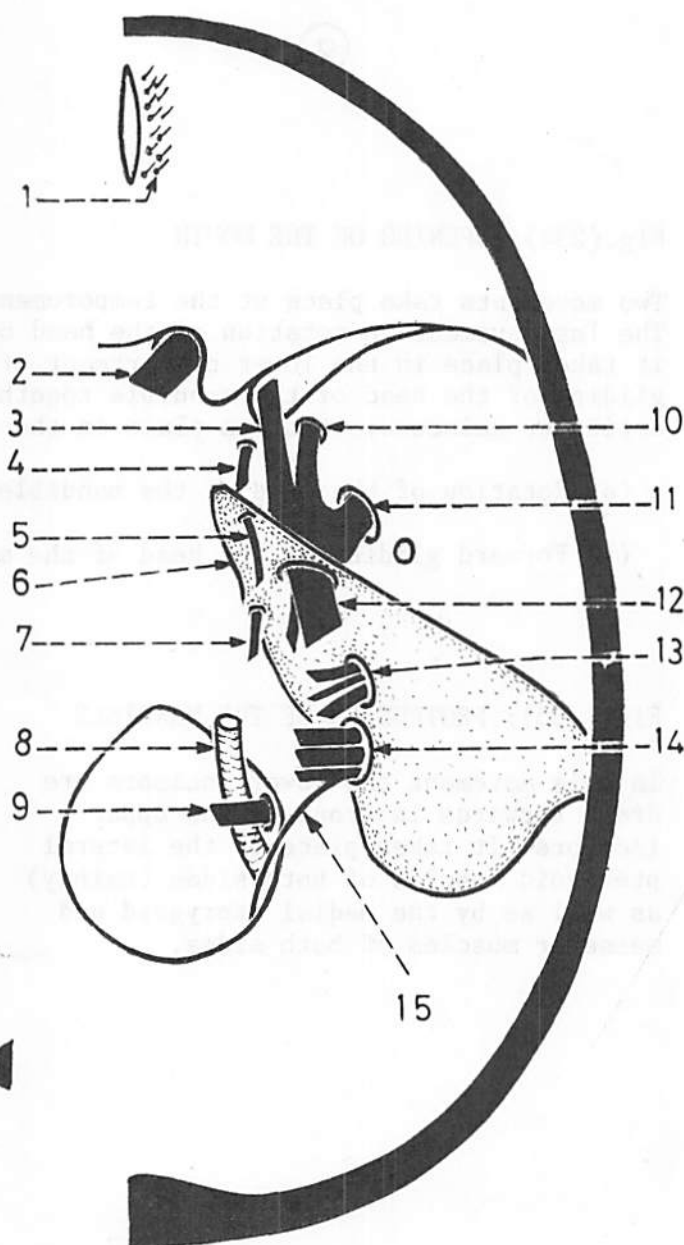


Fig.(237): CRANIAL NERVES

1. olfactory nerve.
2. optic nerve.
3. ophthalmic division of trigeminal nerve.
4. oculomotor nerve.
5. trochlear nerve.
6. apex of petrous temporal bone.
7. abducent nerve.
8. vertebral artery.
9. hypoglossal nerve.
10. maxillary division of trigeminal nerve.
11. mandibular division of trigeminal nerve.
12. trigeminal nerve.
13. internal acoustic meatus transmitting the facial and auditory nerves.
14. jugular foramen transmitting the glossopharyngeal, vagus and accessory nerves.
15. spinal root of accessory nerve.



DURAL FOLDS AND VENOUS SINUSES

Fig.(238): LAYERS OF DURA MATER

The cranial dura mater consists of 2 layers: outer and inner. These 2 layers are closely united together except at certain sites where they separate to enclose the venous sinuses.

1. periosteum.
2. skull bone.
3. outer and inner layers of dura mater fused together.
4. venous sinus.
5. dural fold (an extension of the inner layer).

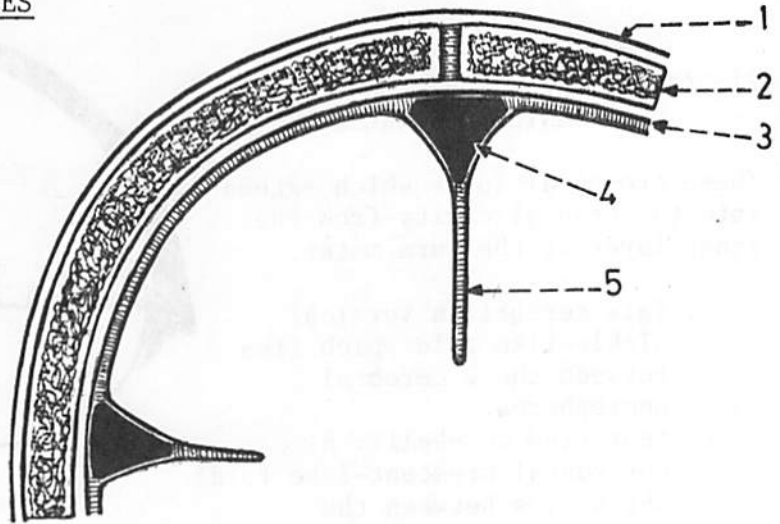


Fig.(239): SITES WHERE THE DURA IS FIXED TO THE BONE

These sites are the sutures, around the foramen magnum and the whole base of the skull.

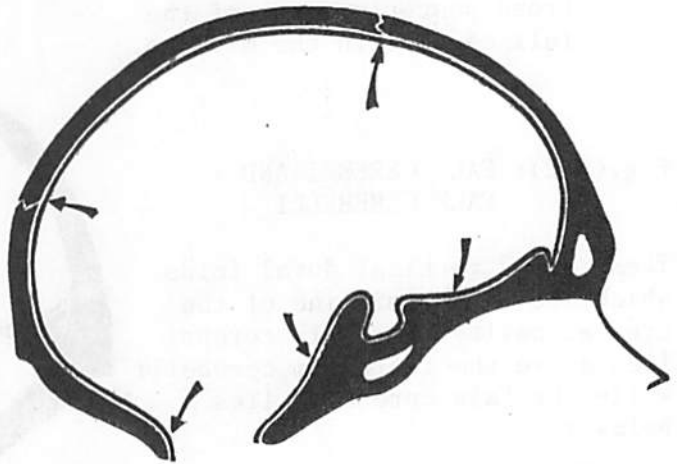


Fig.(240): EXTENSION OF THE DURA MATER AROUND THE OPTIC NERVE

The outer layer of the dura forms a sheath around the optic nerve and is continuous anteriorly with the sclera of the eyeball.

1. dural sheath for the optic nerve.
2. spinal dura mater (continuous with the cranial dura mater at the foramen magnum).

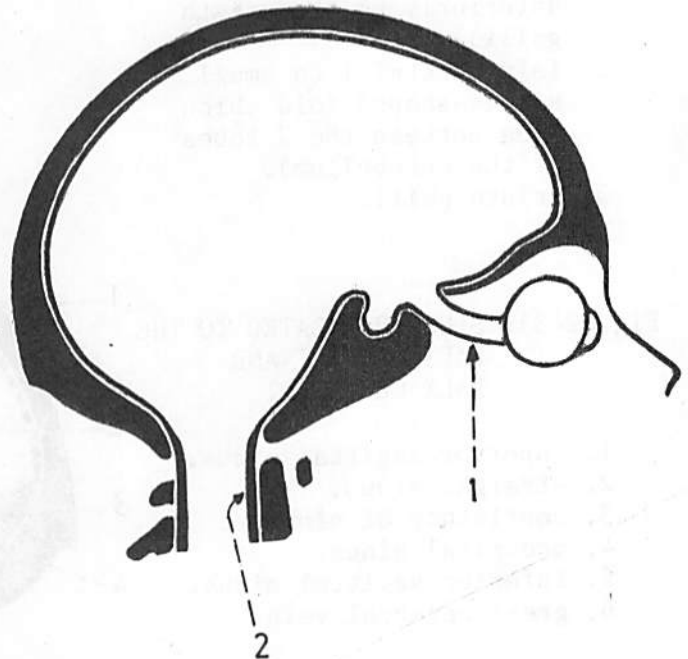


Fig.(241): FALX CEREBRI AND  
TENTORIUM CEREBELLI

These are dural folds which extend into the cranial cavity from the inner layer of the dura mater.

1. falx cerebri: a vertical sickle-like fold which lies between the 2 cerebral hemispheres.
2. tentorium cerebelli: a horizontal crescent-like fold which lies between the cerebellum and occipital lobe of the cerebrum; its upper surface is fused with the broad posterior part of the falx cerebri in the midline.

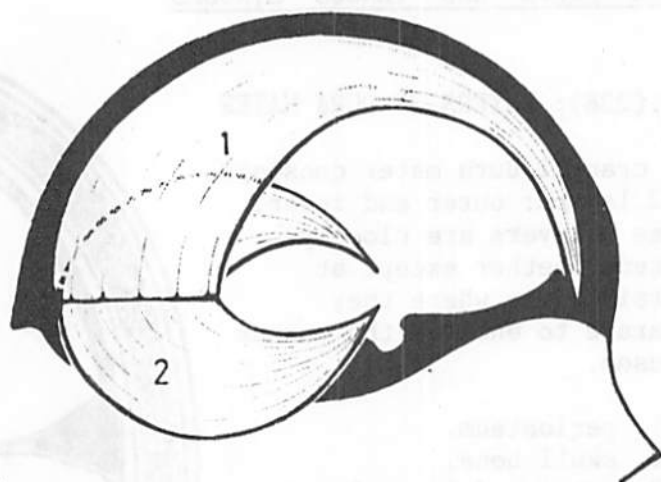


Fig.(242): FALX CEREBRI AND  
FALX CEREBELLI

These are 2 vertical dural folds which lie in the midline of the cranial cavity. The falx cerebri lies above the tentorium cerebelli while the falx cerebelli lies below it.

1. falx cerebri (attached anteriorly to the crista galli).
2. falx cerebelli (a small sickle-shaped fold which lies between the 2 lobes of the cerebellum).
3. crista galli.

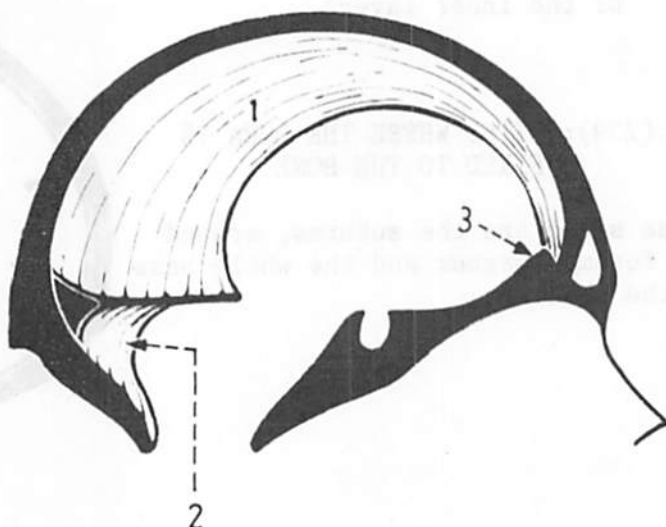


Fig.(243): SINUSES RELATED TO THE  
FALX CEREBRI AND  
FALX CEREBELLI

1. superior sagittal sinus.
2. straight sinus.
3. confluence of sinuses.
4. occipital sinus.
5. inferior sagittal sinus.
6. great cerebral vein.

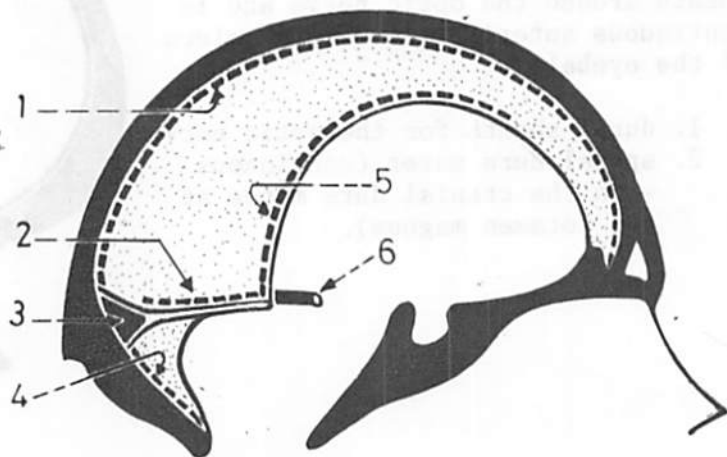




Fig.(244): TENTORIUM CEREBELLI

It has 2 borders: concave free border and convex attached border.

- (a) concave free border  
(extends forwards to get attached to the anterior clinoid process).
- (b) convex attached border  
(attached to the lips of the transverse sulcus, superior petrosal sulcus and ends by being attached to the posterior clinoid process).

- 1. posterior clinoid process.
- 2. anterior clinoid process.
- 3. point of crossing of the free border over the attached border at the apex of the petrous part of the temporal bone.
- 4. tentorial notch (the gap within the free concave border; it is occupied by the midbrain).

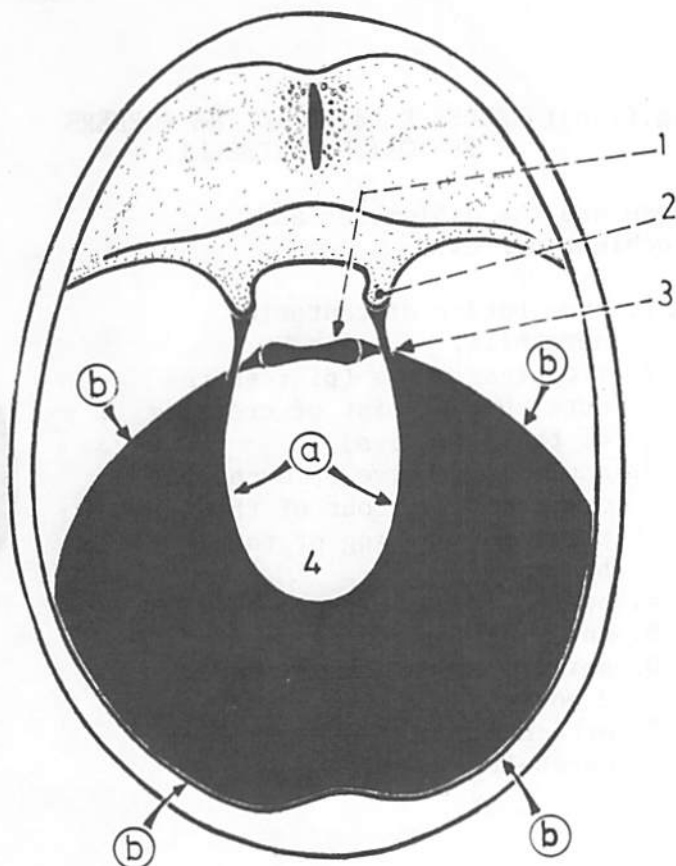


Fig.(245): SINUSES RELATED TO THE TENTORIUM CEREBELLI

- 1. free concave border.
- 2. superior petrosal sinus (at the upper border of petrous temporal bone).
- 3. transverse sinus (at the transverse sulcus).
- 4. straight sinus (at the line of attachment of the falx cerebri to the tentorium cerebelli in the midline).

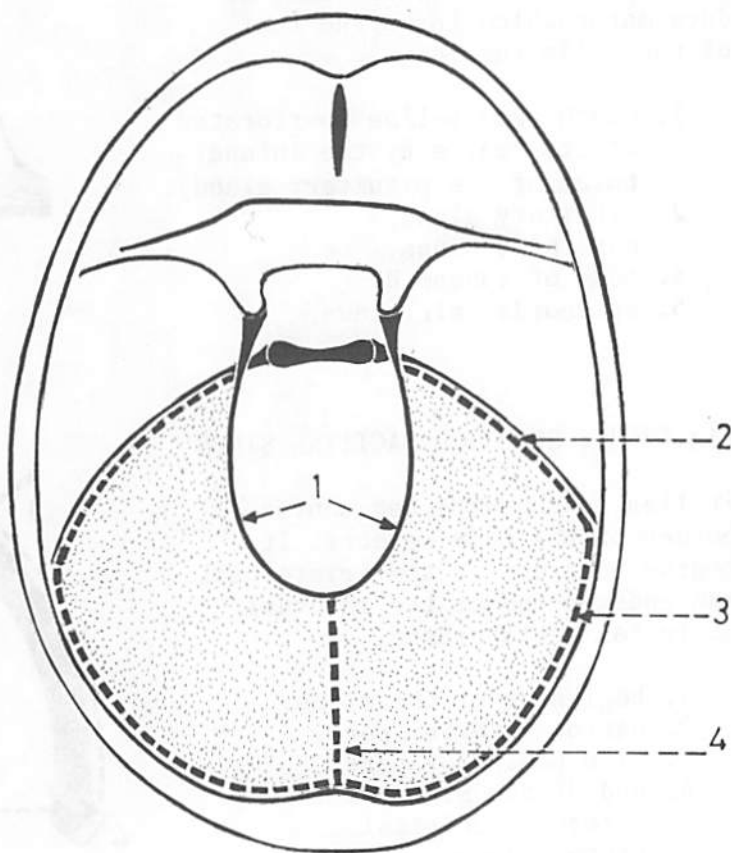


Fig.(246): NERVES RELATED TO THE BORDERS OF TENTORIUM CEREBELLI

These are the oculomotor and trochlear nerves.

1. free border of tentorium cerebelli.
2. trochlear nerve (pierces the dura at the point of crossing of the 2 borders).
3. oculomotor nerve (pierces the dura just in front of the point of crossing of the 2 borders).
4. posterior clinoid process.
5. anterior clinoid process.
6. point of crossing of the 2 borders.
7. attached border of tentorium cerebelli.

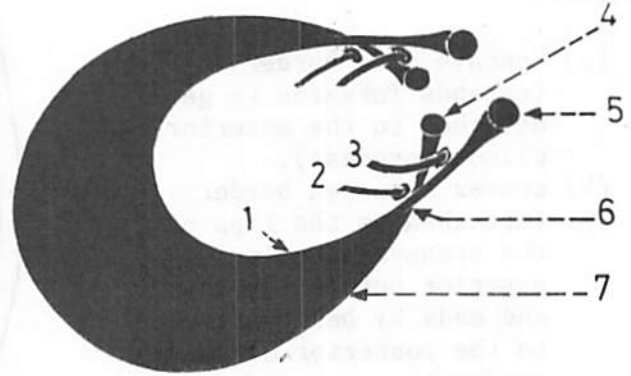


Fig.(247): DIAPHRAGMA SELLAE

It is a small horizontal fold of dura mater which forms the roof of the sella turcica.

1. diaphragma sellae (perforated at its centre by the infundibulum of the pituitary gland).
2. pituitary gland.
3. cavernous sinus.
4. body of sphenoid.
5. sphenoidal air sinus.

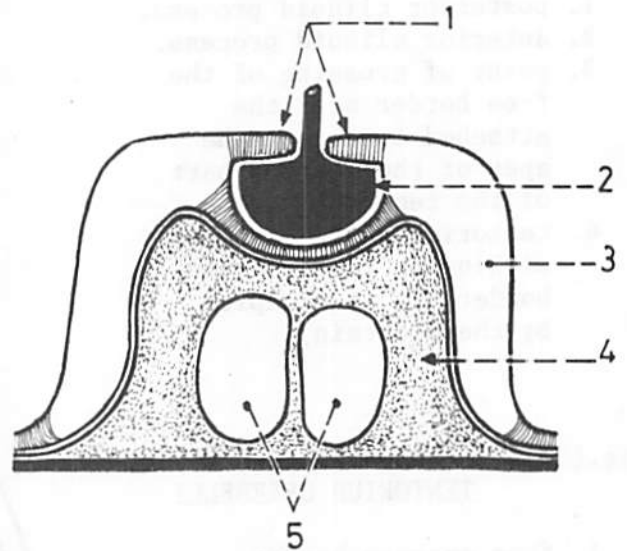


Fig.(248): SUPERIOR SAGITTAL SINUS

It lies in the attached convex border of the falx cerebri. It begins in front at the crista galli and ends behind at the internal occipital protuberance.

1. beginning of the sinus.
2. narrow anterior part.
3. wide posterior part.
4. end of the sinus at the internal occipital protuberance.

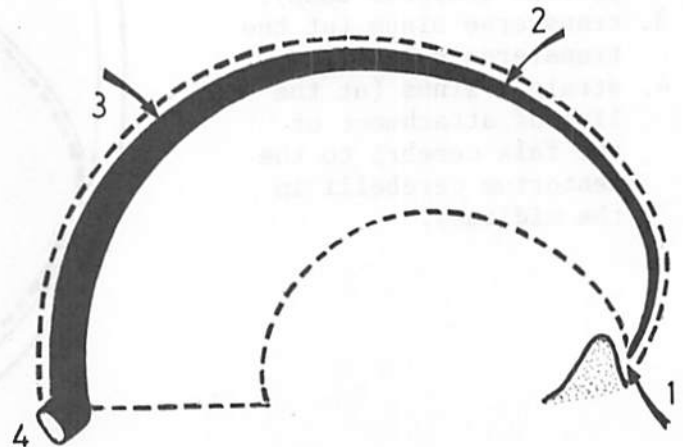




Fig.(249): VENOUS LACUNAE AND ARACHNOID GRANULATIONS RELATED TO THE SUPERIOR SAGITTAL SINUS

The superior sagittal sinus communicates with about 3 venous spaces on each side called venous lacunae. These lacunae receive the diploic and meningeal veins as well as the arachnoid granulations.

1. venous lacuna.
2. arachnoid granulations projecting into the lacuna.
3. superior sagittal sinus in the midline of the cranial vault.

\* Note that the posterior part of the superior sagittal sinus is wider than its anterior part.

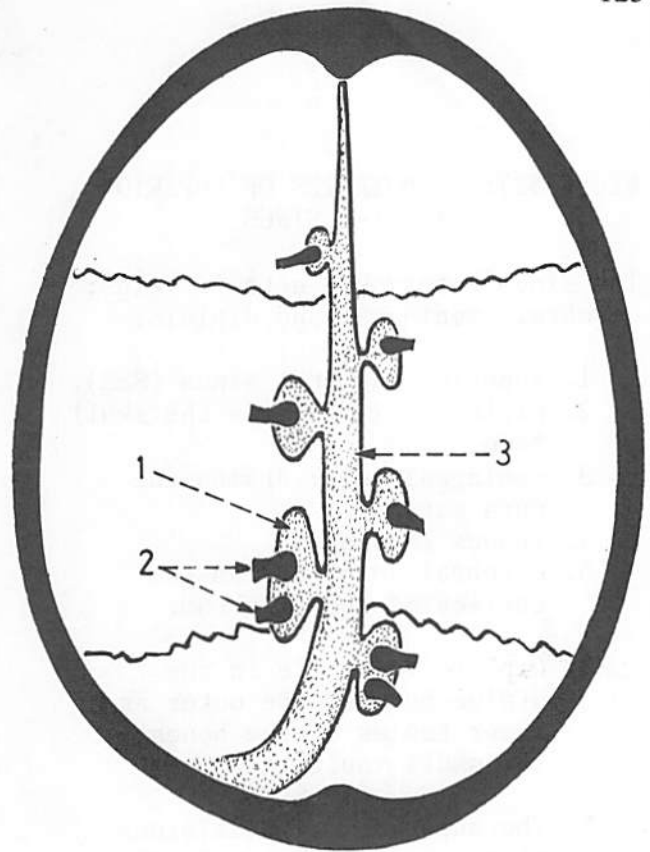


Fig.(250): THE SUPERIOR SAGITTAL SINUS AND VENOUS LACUNAE (coronal section)

1. venous lacuna (venous space on the side of the sinus).
2. superior sagittal sinus.
3. parietal emissary vein.
4. subarachnoid space.
5. arachnoid granulation projecting into the venous lacuna.
6. falx cerebri.

\* Through the arachnoid granulations the cerebrospinal fluid in the subarachnoid space reaches the venous blood in the sinus.

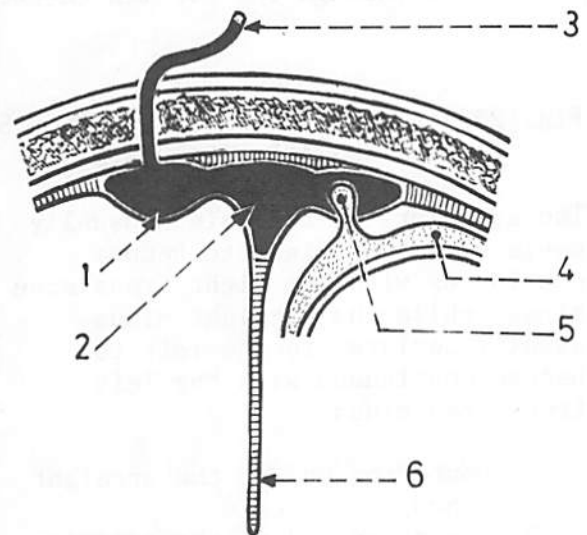


Fig.(251): ARACHNOID GRANULATION

The arachnoid granulation consists of a number of arachnoid villi which project into the sinus.

1. arachnoid villi.
2. superior sagittal sinus (T.S.).
3. dura mater perforated by the arachnoid granulation.
4. subarachnoid space containing trabeculae and cerebrospinal fluid.

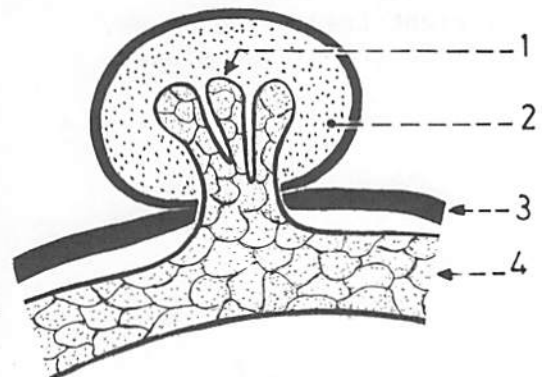


Fig.(252): TRIBUTARIES OF SUPERIOR SAGITTAL SINUS

The sinus receives 3 sets of veins: cerebral, meningeal and diploic.

1. superior sagittal sinus (SSS).
2. diploic vein: drains the skull bone.
3. meningeal vein: drains the dura mater.
4. venous lacuna.
5. cerebral vein: drains the surface of the cerebrum.

- \* Diploic veins lie in the diploe between the outer and inner tables of the bones of the skull vault.
- \* The superior sagittal sinus also receives the parietal emissary vein and an emissary vein through the foramen caecum.

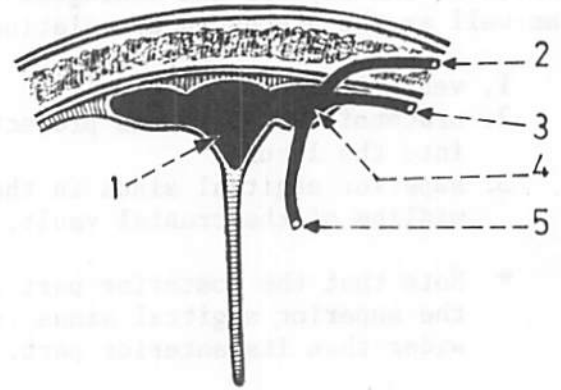


Fig.(253): TERMINATIONS OF SUPERIOR SAGITTAL SINUS AND STRAIGHT SINUS

The superior sagittal sinus usually deviates to the right to become continuous with the right transverse sinus, while the straight sinus usually deviates to the left to become continuous with the left transverse sinus.

1. posterior end of the straight sinus.
2. posterior end of the superior sagittal sinus.
3. right transverse sinus.
4. left transverse sinus.

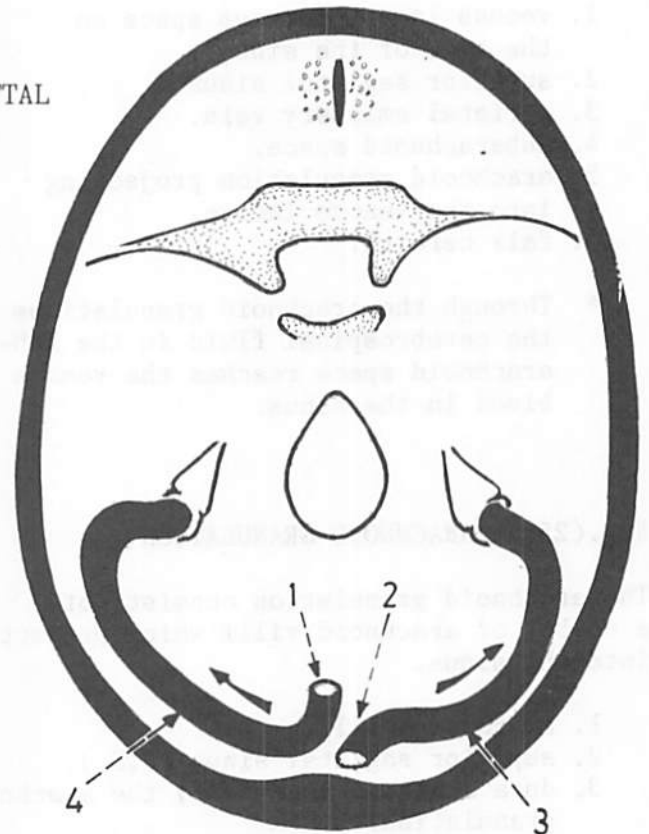


Fig.(254): CONFLUENCE OF SINUSES

It is a common venous space situated on the internal occipital protuberance and receives the superior sagittal sinus, straight sinus and occipital sinus, and leads to both transverse sinuses.

1. end of straight sinus.
2. occipital sinus.
3. confluence of sinuses.
4. end of superior sagittal sinus.
5. right transverse sinus.

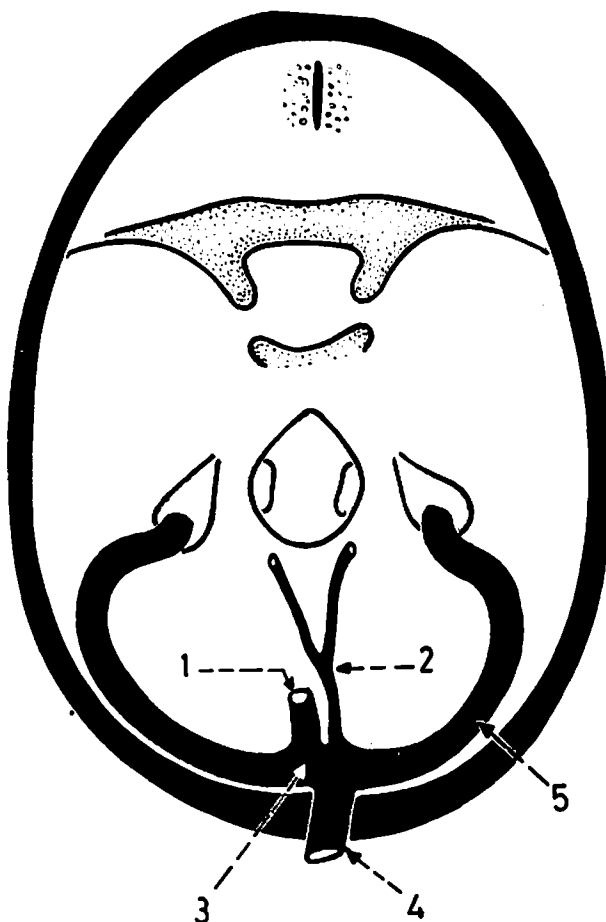


Fig.(255): OCCIPITAL SINUS

It is a small sinus situated in the attached margin of the falx cerebelli. It extends from the foramen magnum anteriorly to the confluence of sinuses posteriorly. It communicates with the internal vertebral plexus of veins.

1. internal vertebral plexus of veins at the foramen magnum.
2. occipital sinus.
3. end of superior sagittal sinus.
4. transverse sinus.

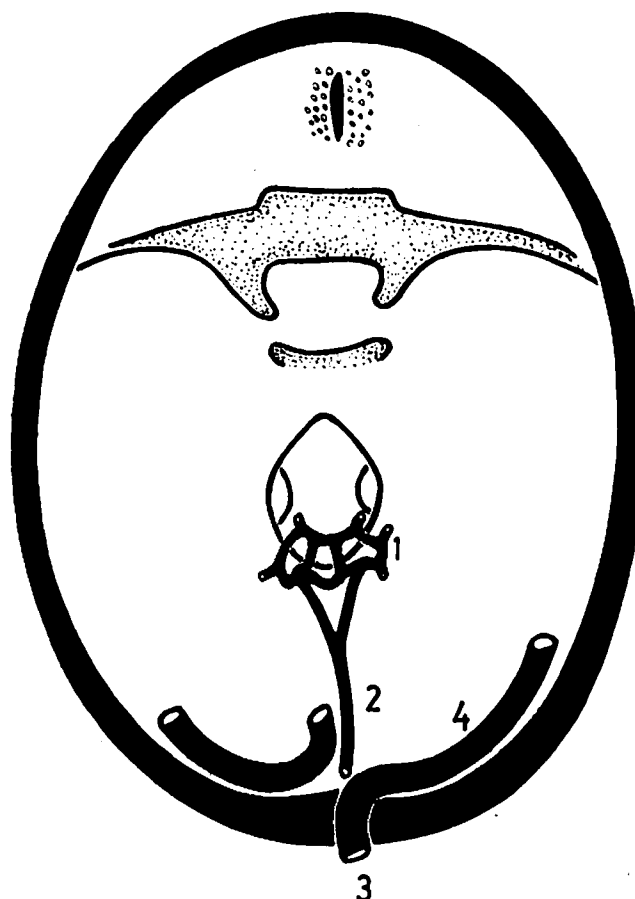


Fig.(256): SIGMOID SINUS

It is a wide S-shaped sinus which lies in a deep groove on the base of the petrous part of temporal bone. Its upper end is continuous with the transverse sinus while its lower end continues as the internal jugular vein in the jugular foramen.

1. beginning of sigmoid sinus.
2. transverse sinus.
3. sigmoid sinus on the base of the petrous temporal bone.
4. superior petrosal sinus (ends into the end of the transverse sinus).

\* The sigmoid sinus is separated from the mastoid antrum in the petrous temporal bone by a very thin plate of bone.

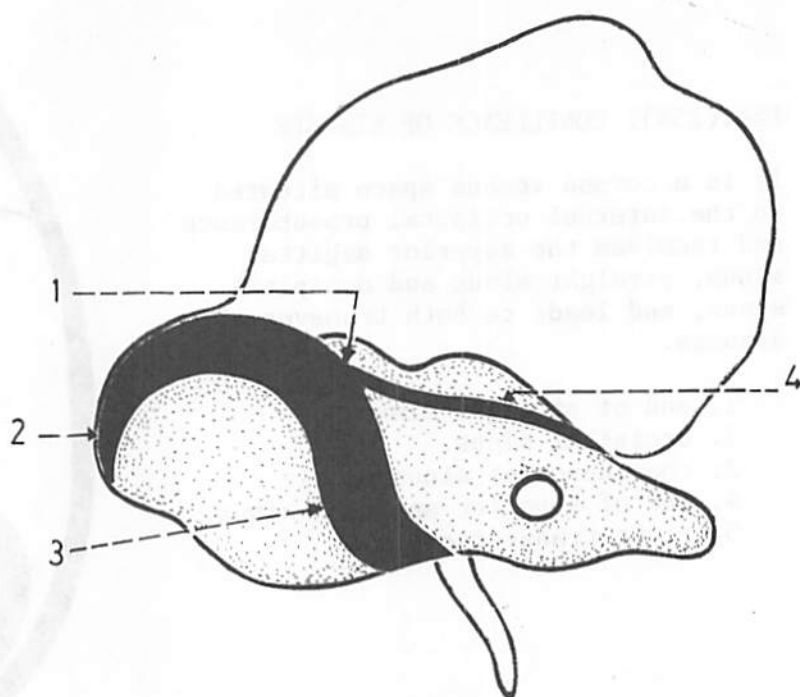


Fig.(257): SUPERIOR AND INFERIOR PETROSAL SINUSES

The superior petrosal sinus lies in the superior petrosal groove on the superior border of petrous temporal bone, and connects the cavernous sinus in front with the transverse sinus behind.

The inferior petrosal sinus lies in the groove between the petrous temporal and basilar part of occipital bone, and connects the cavernous sinus in front with the superior bulb of internal jugular vein behind.

1. cavernous sinus.
2. inferior petrosal sinus.
3. trigeminal ganglion.
4. superior petrosal sinus.
5. transverse sinus.
6. sigmoid sinus.
7. 9th, 10th and 11th cranial nerves.

\* Near the apex of the petrous bone, the superior petrosal sinus crosses over the trigeminal nerve.

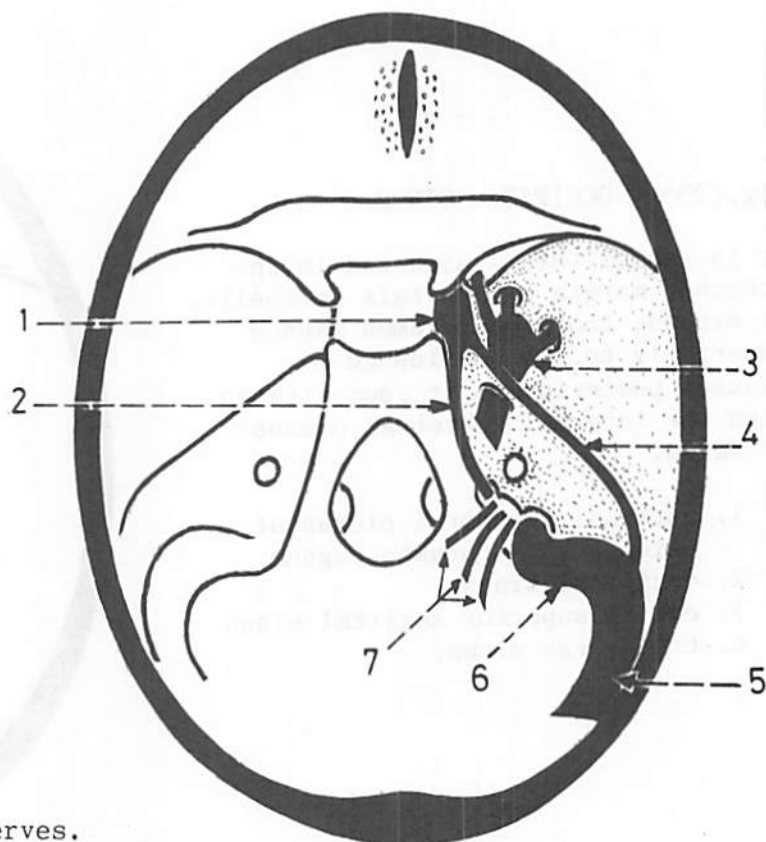


Fig.(258): FINAL DRAINAGE OF THE DURAL SINUSES

All the dural sinuses drain into the internal jugular veins of both sides.

1. inferior sagittal sinus.
2. superior sagittal sinus.
3. straight sinus.
4. transverse sinus.
5. sigmoid sinus.
6. jugular foramen.
7. superior bulb of internal jugular vein.
8. superior petrosal sinus.
9. inferior petrosal sinus.
10. cavernous sinus.
11. great cerebral vein.

\* Note that the flow of the blood in the dural sinuses is from before backwards towards the jugular foramen.

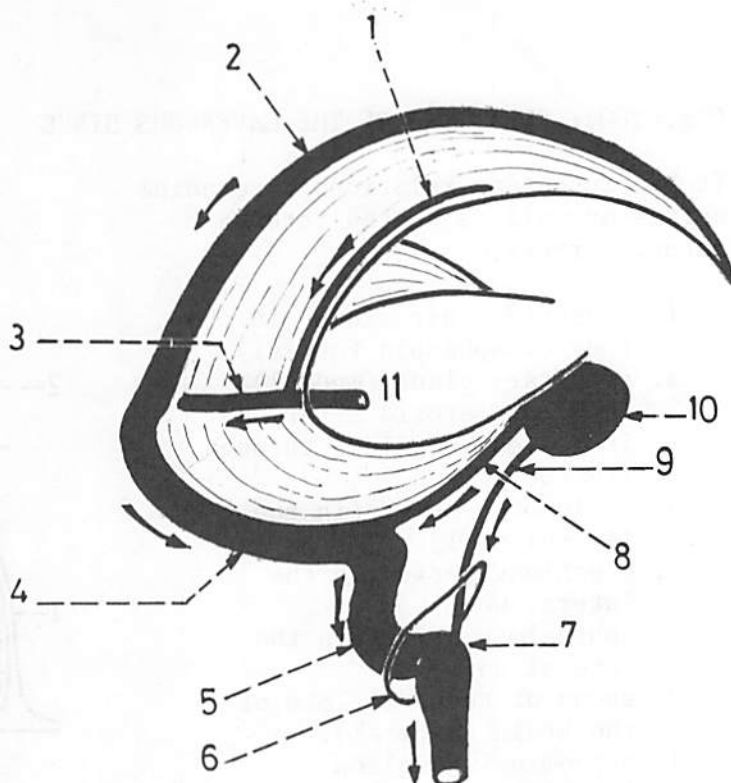


Fig.(259): POSITION OF THE CAVERNOUS SINUS

It lies on the side of the body of the sphenoid, extending from the superior orbital fissure in front to the apex of the petrous bone behind.

1. body of the sphenoid.
2. superior orbital fissure.
3. cavernous sinus.
4. apex of petrous part of temporal bone.

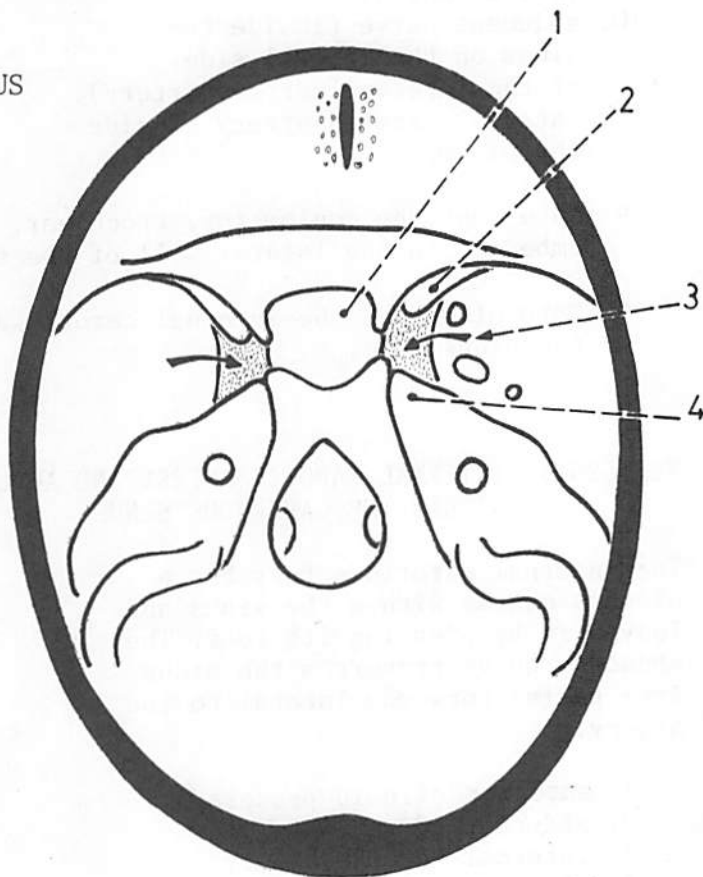
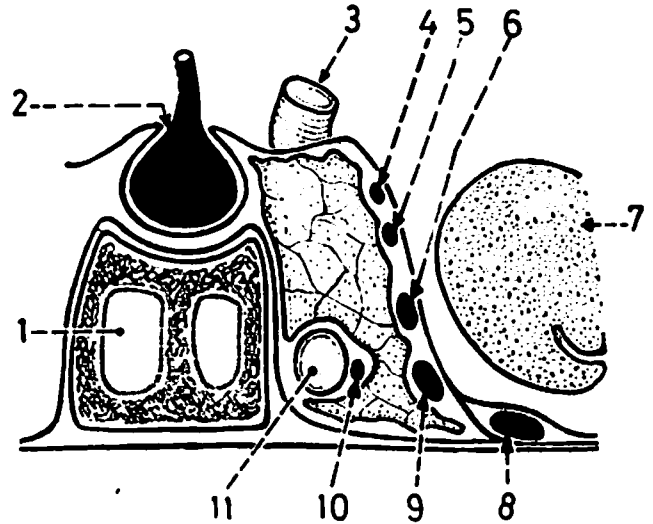


Fig.(260): RELATIONS OF THE CAVERNOUS SINUS

It has important relations to cranial nerves as well as to the internal carotid artery.

1. sphenoidal air sinus in the body of sphenoid (medial).
2. pituitary gland (medial).
3. internal carotid artery as it leaves the sinus through its roof.
4. oculomotor nerve (in the lateral wall).
5. trochlear nerve (in the lateral wall).
6. ophthalmic nerve (in the lateral wall).
7. uncus of temporal lobe of the brain (lateral).
8. trigeminal ganglion (lateral).
9. maxillary nerve (in the lateral wall).
10. abducent nerve (inside the sinus on the lateral side of the internal carotid artery).
11. internal carotid artery (inside the sinus).



\* Note that the oculomotor, trochlear, ophthalmic and maxillary nerves are embedded in the lateral wall of the sinus from above downwards.

\* Note also that the internal carotid artery and abducent nerve lie within the sinus.

Fig.(261): INTERNAL CAROTID ARTERY AND ABDUCENT NERVE WITHIN THE CAVERNOUS SINUS

The internal carotid artery has a sinuous course within the sinus and leaves it by piercing its roof. The abducent nerve traverses the sinus from behind forwards lateral to the artery.

1. anterior clinoid process.
2. abducent nerve.
3. internal carotid artery.
4. ophthalmic artery.
5. optic nerve.

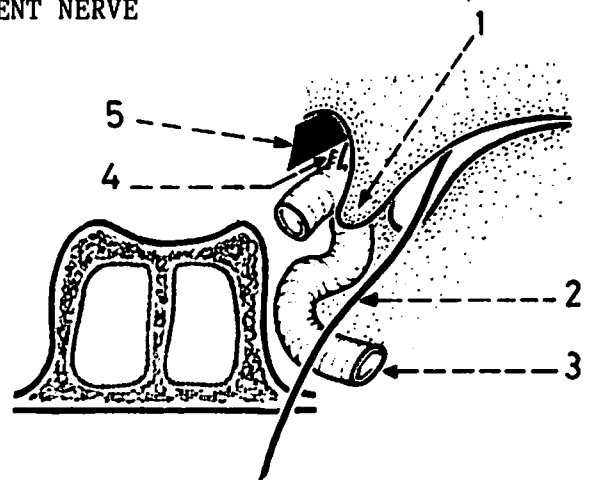
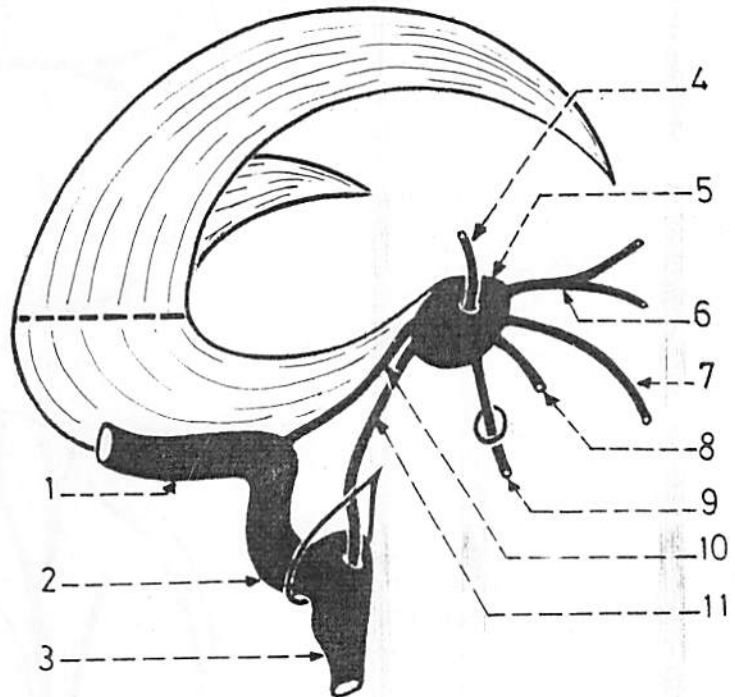


Fig.(262): TRIBUTARIES AND COMMUNICATIONS OF THE CAVERNOUS SINUS

The cavernous sinus receives the sphenoparietal sinus, ophthalmic veins, superficial middle cerebral vein and anterior branch of middle meningeal vein. It communicates with the pterygoid plexus of veins (through an emissary vein), with the other cavernous sinus (through intercavernous sinuses), with the transverse sinus (through the superior petrosal sinus) and with the internal jugular vein (through the inferior petrosal sinus).

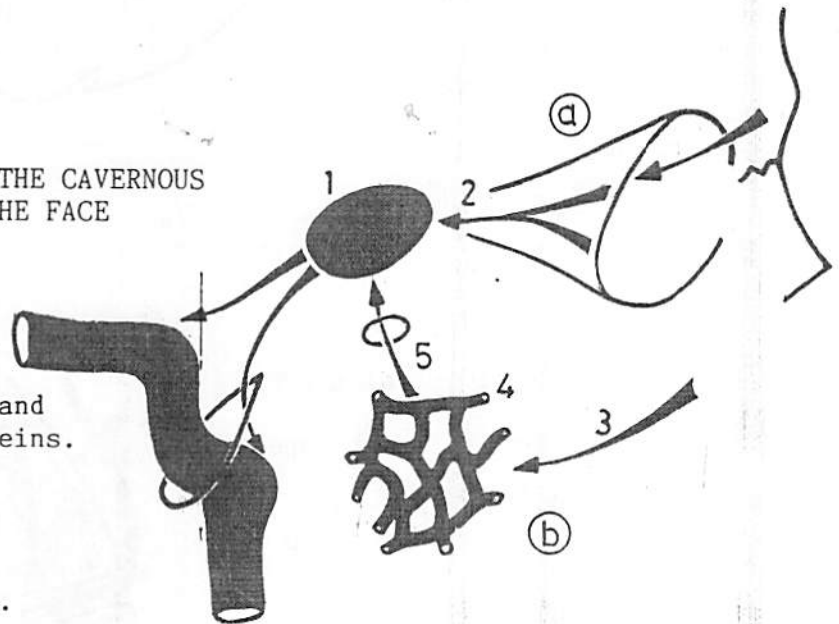


1. transverse sinus.
2. sigmoid sinus.
3. internal jugular vein.
4. superficial middle cerebral vein (from the brain).
5. cavernous sinus.
6. ophthalmic vein (or veins).
7. sphenoparietal sinus.
8. anterior branch of middle meningeal vein.
9. emissary vein from the pterygoid plexus.
10. superior petrosal sinus.
11. inferior petrosal sinus.

Fig.(263): CONNECTIONS BETWEEN THE CAVERNOUS SINUS AND VEINS OF THE FACE

There are 2 connections:

- (a) Via the ophthalmic vein .
- (b) Via the deep facial vein and the pterygoid plexus of veins.



1. cavernous sinus.
2. ophthalmic vein .
3. deep facial vein.
4. pterygoid plexus of veins.
5. emissary vein through the foramen ovale.



MENINGEAL AND DIPLOIC VEINS

Fig.(264): MIDDLE MENINGEAL VEINS

They lie on the inner aspect of the parietal bone in company with the branches of the middle meningeal artery. They form anterior and posterior trunks which end differently below.

1. anterior trunk (ends in the cavernous sinus or the pterygoid plexus).
2. posterior trunk (ends in the pterygoid plexus).
3. pterygoid plexus of veins.

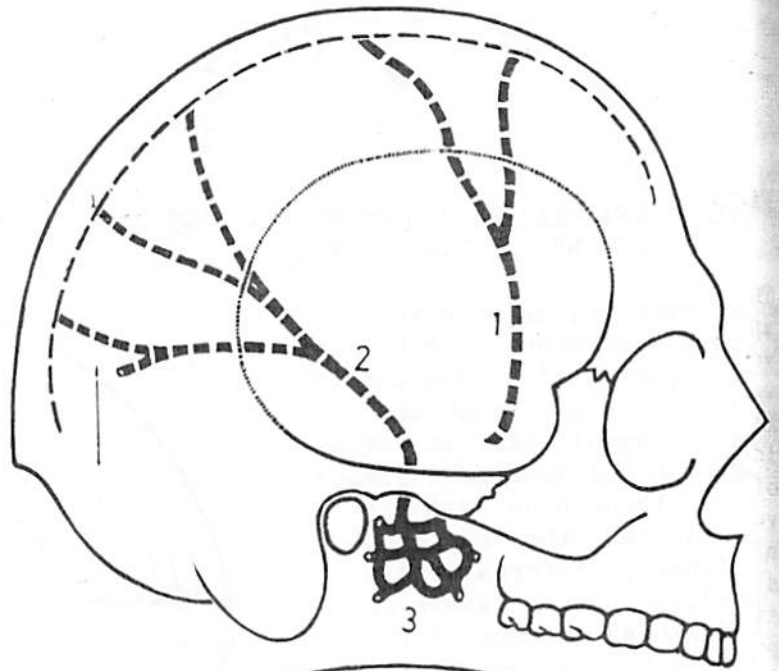


Fig.(265): DIPLOIC VEINS

These are thin-walled veins which lie in the diploe of the cranial bones. They lie in the frontal, temporal and occipital bones.

1. frontal diploic vein (ends in the supraorbital vein).
2. anterior temporal diploic vein (ends in the sphenoparietal sinus).
3. posterior temporal diploic vein (ends in the transverse sinus).
4. occipital diploic vein (is the largest and ends into the beginning of the transverse sinus).

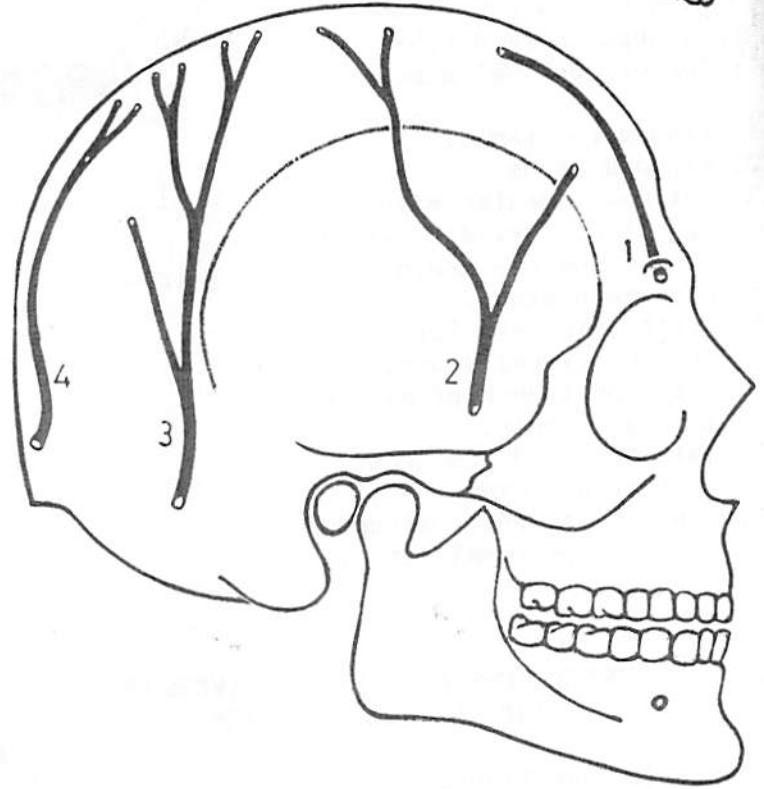
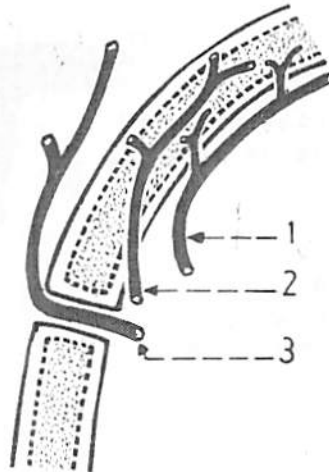


Fig.(266): VEINS RELATED TO CRANIAL BONES

1. meningeal vein: on the inner aspect of the bone.
2. diploic vein: inside the cranial bone.
3. emissary vein: passes through an emissary foramen.

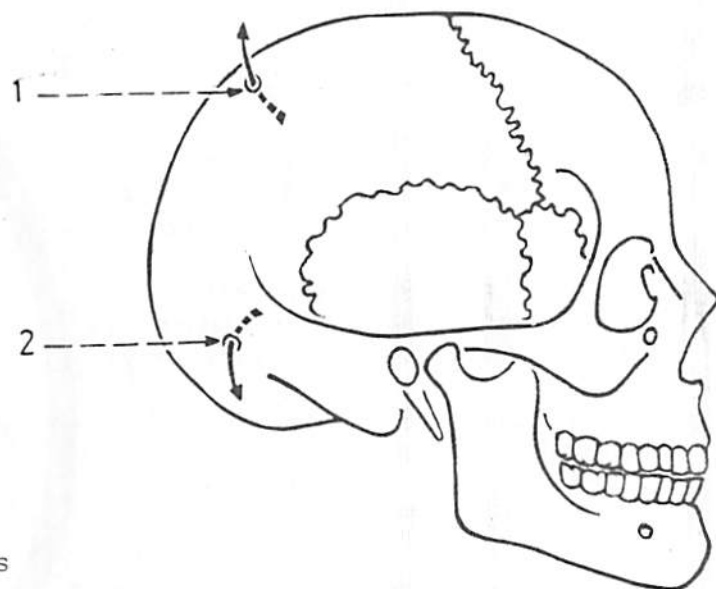




EMISSARY VEINS

Fig.(267): PARIETAL AND MASTOID EMISSARY VEINS

1. parietal emissary vein: passes through the parietal foramen and connects the superior sagittal sinus with the veins of the scalp at the vertex.
2. mastoid emissary vein: passes through the mastoid foramen and connects the sigmoid sinus with the occipital veins.



\* An emissary vein is a valveless vein which connects the veins outside the skull with the dural venous sinuses.

Fig.(268): EMISSARY VEINS IN THE BASE OF THE SKULL

1. a vein through the foramen caecum: joins the superior sagittal sinus with the veins of the nose (not constant).
2. ophthalmic vein: joins veins of the forehead with the cavernous sinus.
3. a vein through foramen ovale: joins the cavernous sinus with the pterygoid plexus.
4. plexus of veins in the carotid canal: joins the cavernous sinus with the internal jugular vein.
5. veins through foramen lacerum: joins the cavernous sinus with the pharyngeal veins.
6. internal vertebral plexus of veins: passes through the foramen magnum to join the occipital sinus.
7. posterior condylar vein: passes through the posterior condylar foramen and joins the sigmoid sinus with the veins in the suboccipital triangle.
8. a vein through the hypoglossal canal: joins the sigmoid sinus with the internal jugular vein.
9. mastoid emissary vein: see figure(267).

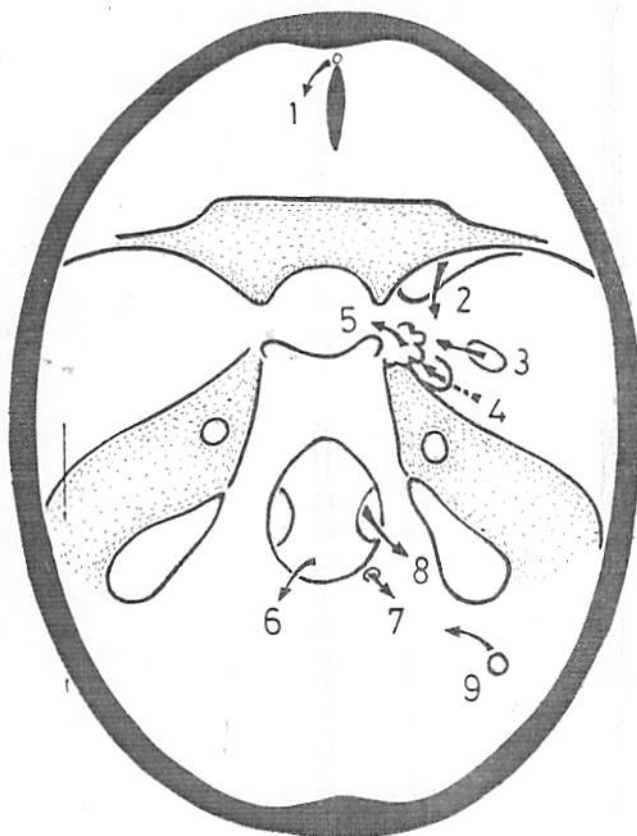


Fig.(269): ARTERIES OF DURA MATER

- (a) Dura of anterior cranial fossa: supplied by anterior and posterior ethmoidal arteries (from ophthalmic).
- (b) Dura of middle cranial fossa: supplied by middle and accessory meningeal arteries (from maxillary).
- (c) Dura of posterior cranial fossa: supplied by meningeal branches of the occipital and vertebral arteries.

\* These meningeal arteries are partly distributed to the dura and partly to the bones of the skull.

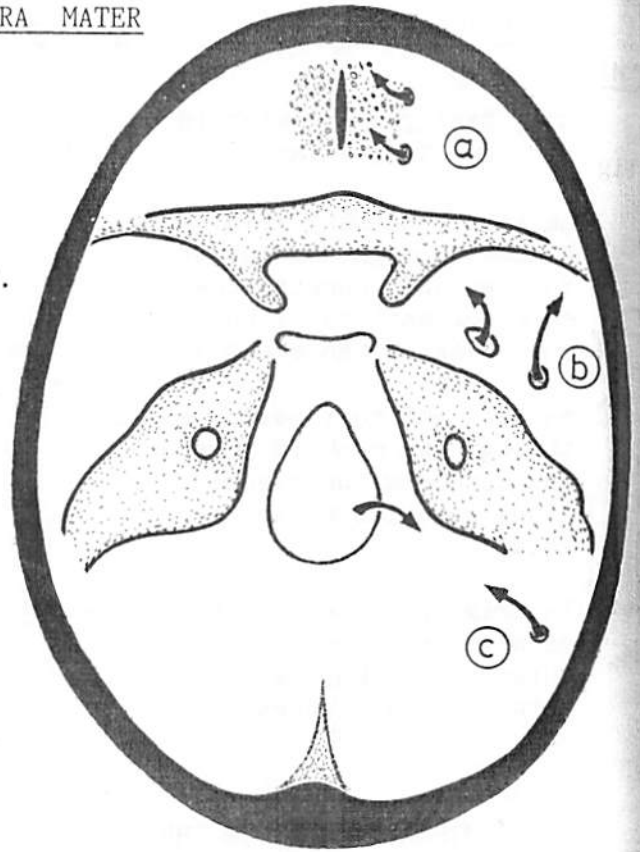
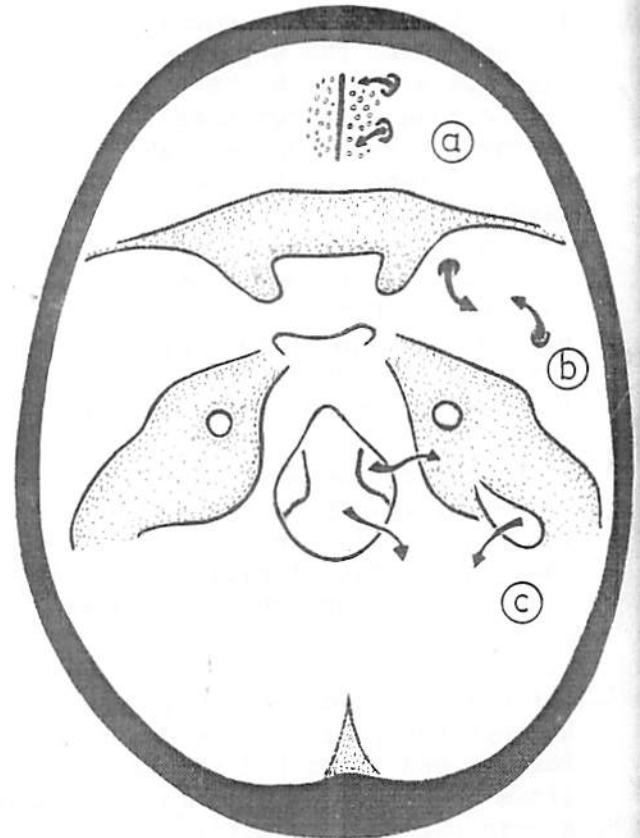


Fig.(270): NERVES OF DURA MATER

These are sensory branches which are derived mainly from the trigeminal nerve to the anterior and middle cranial fossae and from the upper 3 cervical nerves to the posterior cranial fossa.

- (a) Dura of anterior cranial fossa: supplied by the ethmoidal nerves (from ophthalmic).
- (b) Dura of middle cranial fossa: supplied by nervus spinosus (from mandibular) and meningeal branch of maxillary nerve.
- (c) Dura of posterior cranial fossa: supplied by meningeal branches of the vagus and hypoglossal nerves as well as by branches from the upper 3 cervical nerves.



## HYPOPHYSIS CEREBRI..

Fig.(271): RELATIONS OF HYPOPHYSIS CEREBRI (PITUITARY GLAND)

It is a small endocrine gland situated in the hypophyseal fossa and is covered by the diaphragma sellae. It is related on each side to a cavernous sinus and its contents, and below to the sphenoidal air sinus.

1. diaphragma sellae.
2. tuber cinereum of hypothalamus.
3. infundibulum (a part of the hypothalamus connecting the gland to the tuber cinereum).
4. hypophysis cerebri.
5. cavernous sinus.
6. sphenoidal air sinus.

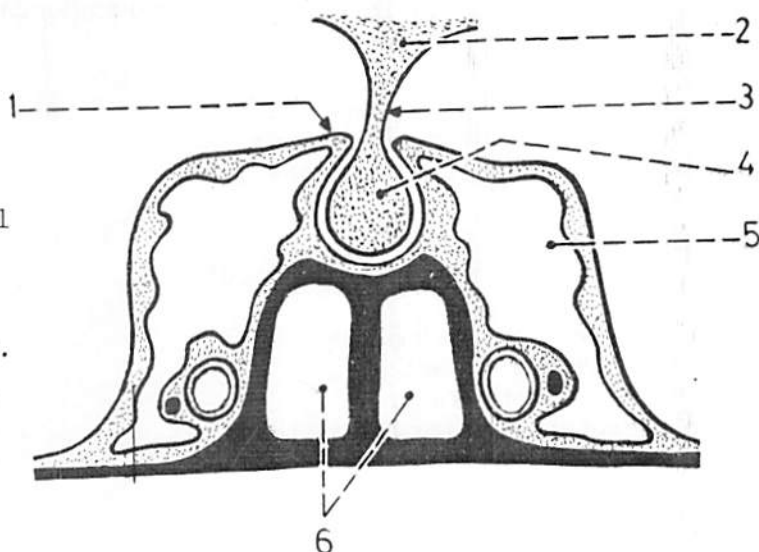


Fig.(272): RELATION OF THE GLAND TO OPTIC CHIASMA

The optic chiasma lies above and in front of the pituitary gland.

1. pituitary gland.
2. optic chiasma (consists of decussating nasal fibres of the 2 optic nerves).
3. optic groove.
4. sphenoidal air sinus (below and in front of the gland).

\* A tumour of the pituitary gland may compress the optic chiasma leading to visual defects.

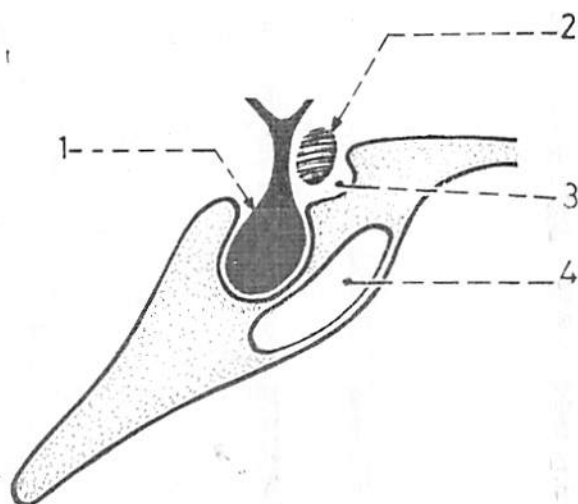


Fig.(273): PARTS OF HYPOPHYSIS CEREBRI

The gland consists of 2 lobes: anterior lobe (adenohypophysis) and posterior lobe (neurohypophysis).

1. infundibulum (connects the neurohypophysis to the tuber cinereum).
2. neurohypophysis (posterior lobe).
3. tuber cinereum.
4. pars tuberalis of adenohypophysis.
5. pars intermedia of adenohypophysis.
6. pars anterior of adenohypophysis.

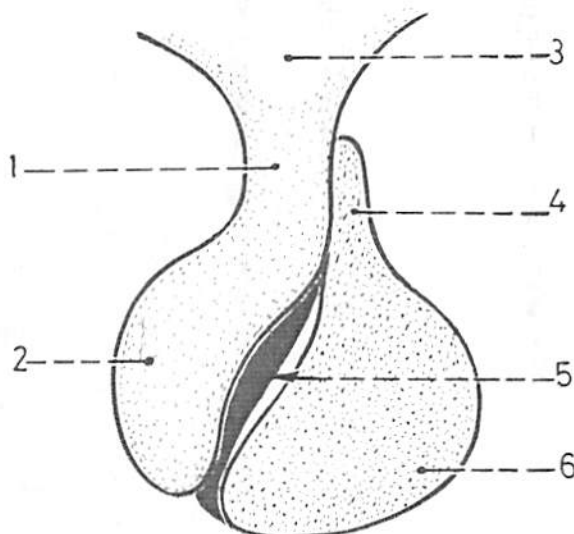


Fig.(274): NERVOUS CONNECTION OF THE NEUROHYPOPHYSIS WITH THE HYPOTHALAMUS

The neurohypophysis is connected to the hypothalamus by nerve fibres forming the hypothalamo-hypophysial tract.

1. supra-optic and paraventricular nuclei.
2. fibres of hypothalamo-hypophysial tract.
3. neurohypophysis.
4. adenohypophysis.

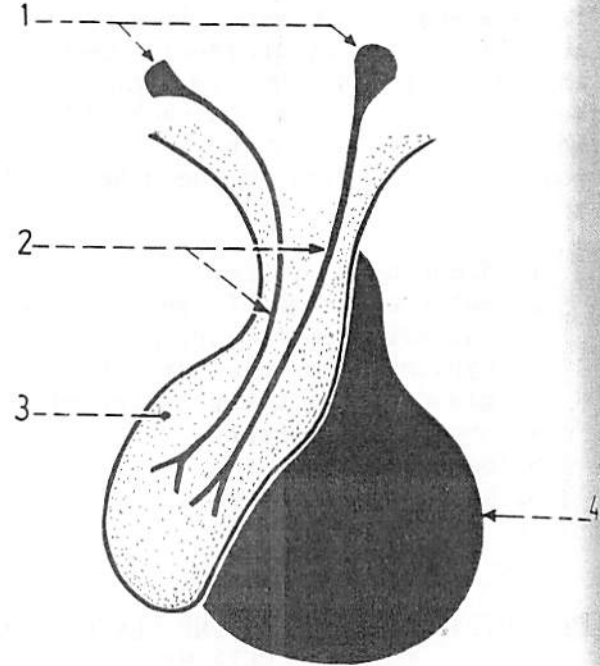
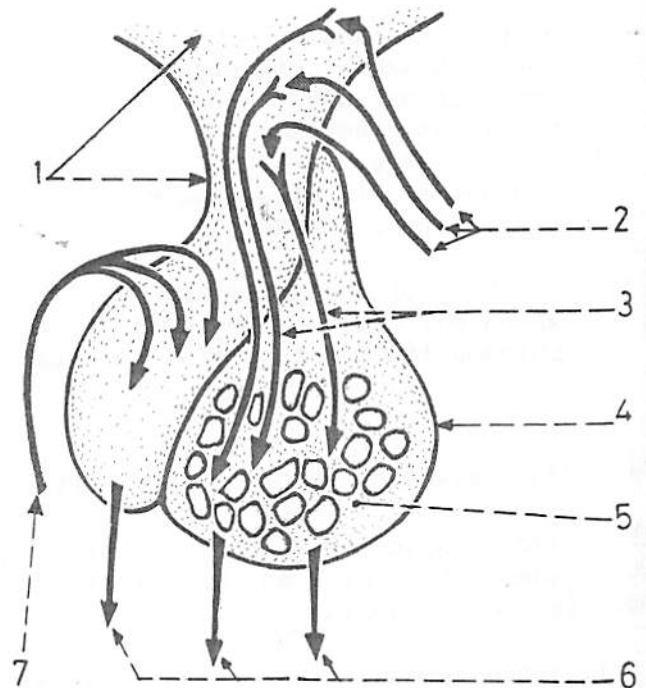


Fig.(275): BLOOD VESSELS OF HYPOPHYSIS CEREBRI

It is supplied by hypophysial arteries from the internal carotid artery. The hypophysial veins end in the cavernous sinus.

The gland has another system of vessels called portal vessels which arise in the capillary plexuses present in the median eminence and infundibulum. These vessels descend to the pars anterior of the adenohypophysis where they open into the vascular sinusoids. This portal system carries hormone-releasing factors secreted from the hypothalamus to the adenohypophysis.

1. median eminence and infundibulum.
2. superior hypophysial arteries.
3. portal vessels (connecting the plexus on the median eminence and infundibulum to the sinusoids of pars anterior of adenohypophysis).
4. pars anterior of adenohypophysis.
5. blood sinusoids.
6. hypophysial veins (drain into the cavernous sinus).
7. inferior hypophysial artery (to the neurohypophysis).



\* Note that the hypophysis is connected to the hypothalamus by both nervous and vascular connections.

## CONTENTS OF THE ORBIT

### EXTRAOCULAR MUSCLES

Fig.(276): EXTRAOCULAR MUSCLES

These are 7 muscles: 4 recti (superior, inferior, medial and lateral), 2 obliques (superior and inferior) and the levator palpebrae superioris.

1. superior oblique.
2. superior rectus.
3. medial rectus.
4. lateral rectus.
5. inferior rectus.
6. inferior oblique.
7. trochlea for the tendon of superior oblique.

\* The 4 recti are inserted into the sclera in front of the equator of the eyeball.

\* The 2 oblique muscles are inserted behind the equator.

\* The tendon of superior oblique passes through the trochlea to change its direction.

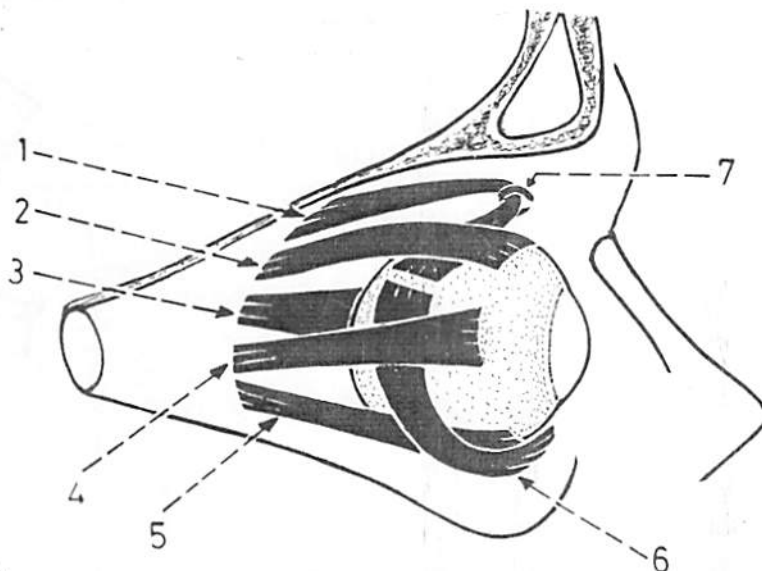
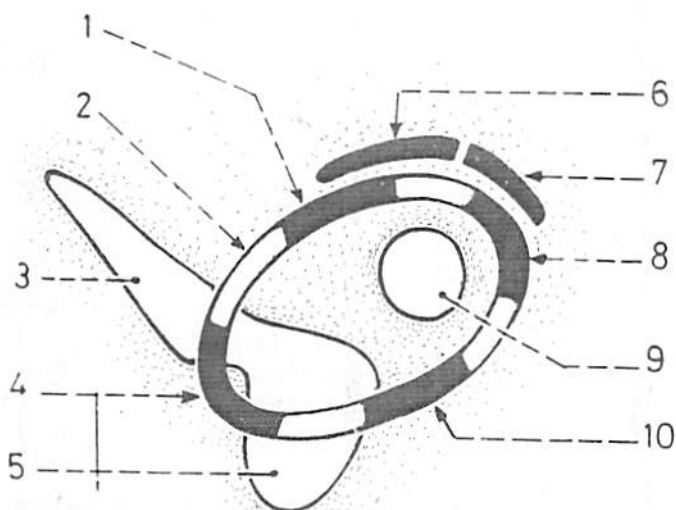


Fig.(277): ORIGIN OF EXTRAOCULAR MUSCLES

All the extraocular muscles except the inferior oblique arise from a common tendinous ring at the apex of the orbit and from the adjoining part of the roof.



1. origin of superior rectus.
2. common tendinous ring (surrounds the optic canal and the medial part of superior orbital fissure).
3. lateral part of superior orbital fissure.
4. origin of lateral rectus.
5. medial part of superior orbital fissure.
6. origin of levator palpebrae superioris (from the roof).
7. origin of superior oblique (from the roof).
8. origin of medial rectus.
9. optic canal (within the tendinous ring).
10. origin of inferior rectus.

Fig.(278): ORIGIN OF INFERIOR  
OBLIQUE MUSCLE

It arises from the antero-medial part of the floor of the orbit, just lateral to the nasolacrimal groove.

1. nasolacrimal groove.
2. origin of inferior oblique.

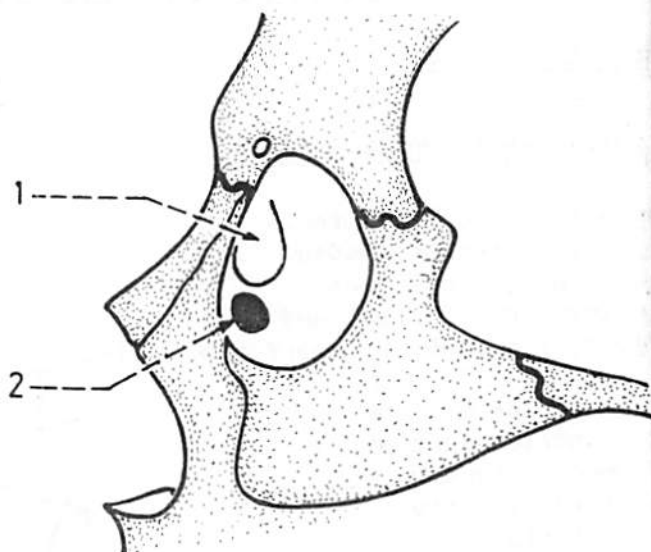
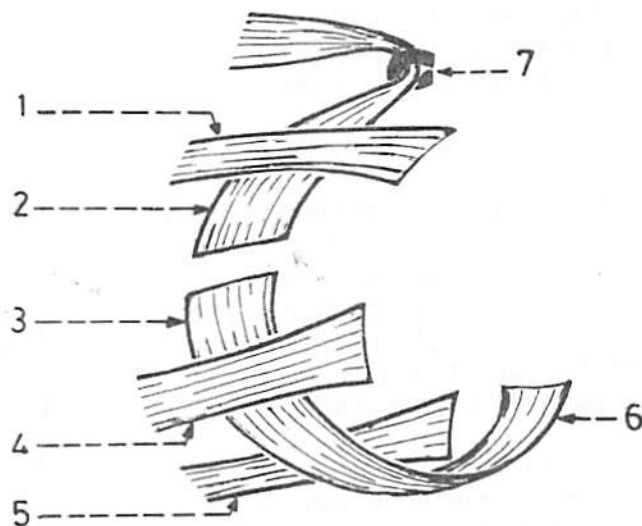


Fig.(279): SUPERIOR AND INFERIOR  
OBLIQUE MUSCLES

The superior oblique runs at first forwards along the medial wall of the orbit to end in a rounded tendon. This tendon passes through the trochlea and changes its direction to pass backwards and laterally below the rectus superior.

The inferior oblique runs laterally, backwards and upwards at first between the inferior rectus and floor of the orbit and then medial to the lateral rectus.

1. superior rectus.
2. insertion of superior oblique.
3. insertion of inferior oblique.
4. lateral rectus.
5. inferior rectus.
6. origin of inferior oblique.
7. trochlea of superior oblique (attached to the trochlear fossa at the antero-medial part of the roof of the orbit).

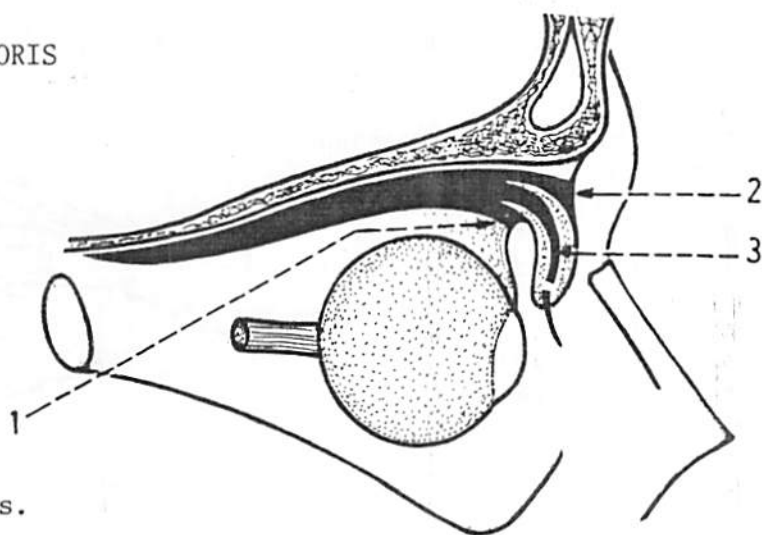


\* Note that the recti muscles are inserted at a more anterior plane than the oblique muscles.



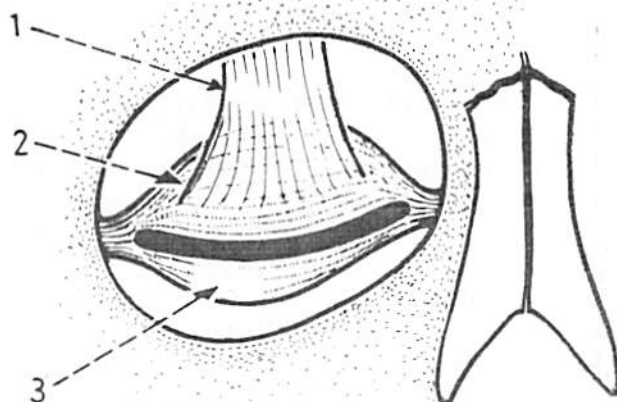
Fig.(280): LEVATOR PALPEBRAE SUPERIORIS

It is the elevator muscle of the upper eyelid. It extends forwards along the roof of the orbit to end in a wide aponeurosis which is attached to the skin of upper eyelid, superior tarsus and upper fornix of conjunctiva.



1. insertion into upper fornix of conjunctiva.
2. insertion into skin of upper eyelid.
3. insertion into superior tarsus.

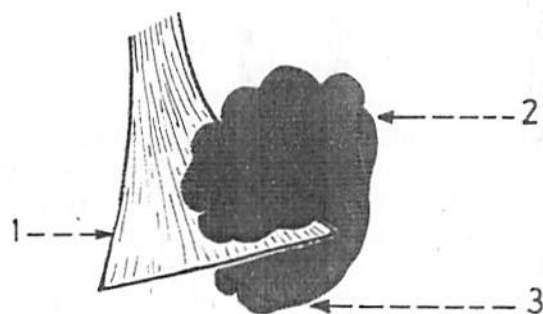
Fig.(281): INSERTION OF LEVATOR PALPEBRAE INTO THE SUPERIOR TARSUS



1. tendon of insertion of levator palpebrae superioris.
2. superior tarsus.
3. inferior tarsus.

\* The tarsus is a plate of dense fibrous tissue which supports the eyelid. The 2 tarsi are attached to the lateral and medial orbital margins by the lateral and medial palpebral ligaments respectively.

Fig.(282): RELATION OF LEVATOR PALPEBRAE SUPERIORIS TO THE LACRIMAL GLAND



The aponeurosis of the muscle dips between the orbital and palpebral parts of the lacrimal gland.

1. aponeurosis of levator palpebrae superioris.
2. orbital part of lacrimal gland.
3. palpebral part of lacrimal gland (in the upper eyelid).

Fig.(283): NERVE SUPPLY OF  
EXTRAOCULAR MUSCLES

All extraocular muscles are supplied by the oculomotor nerve except 2 muscles which are: superior oblique by trochlear nerve and lateral rectus by abducent nerve.

1. trochlear nerve: to superior oblique.
2. abducent nerve: to lateral rectus.

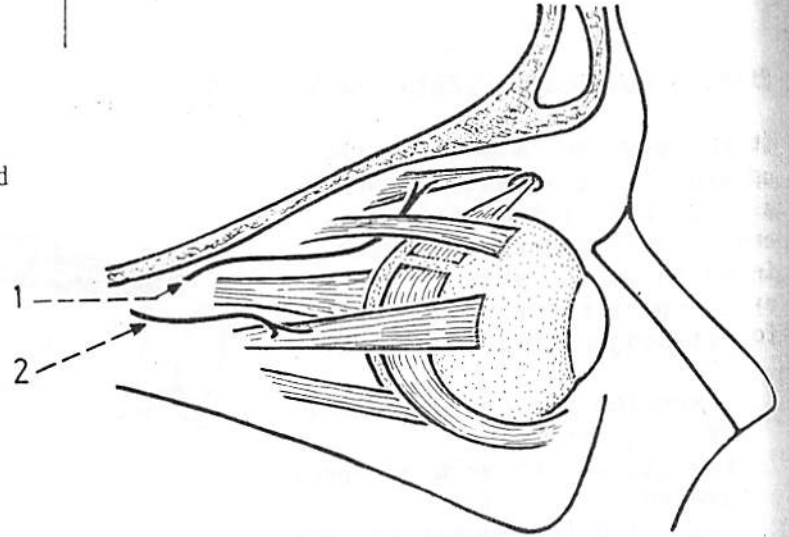


Fig.(284): ACTION OF MEDIAL AND  
LATERAL RECTI

The medial rectus produces medial deviation of the cornea, while the lateral rectus produces lateral deviation of the cornea.

1. direction of pull of medial rectus muscle.
2. direction of pull of lateral rectus muscle.

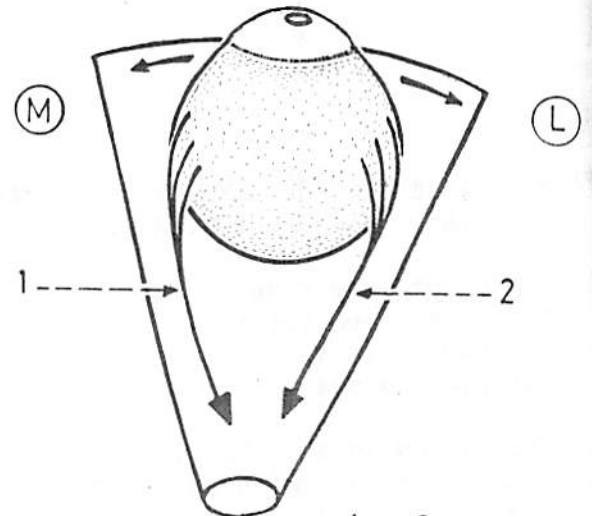


Fig.(285): ACTION OF SUPERIOR AND  
INFERIOR RECTI

The superior and inferior recti lie in the orbital axis which is directed forwards and laterally, while the axis of the eyeball (optic axis) is directed straight forwards. As a result, these 2 muscles produce medial deviation of the cornea in addition to elevation or depression.

1. optic axis.
2. orbital axis.
3. superior rectus (elevation and medial deviation).
4. inferior rectus (depression and medial deviation).

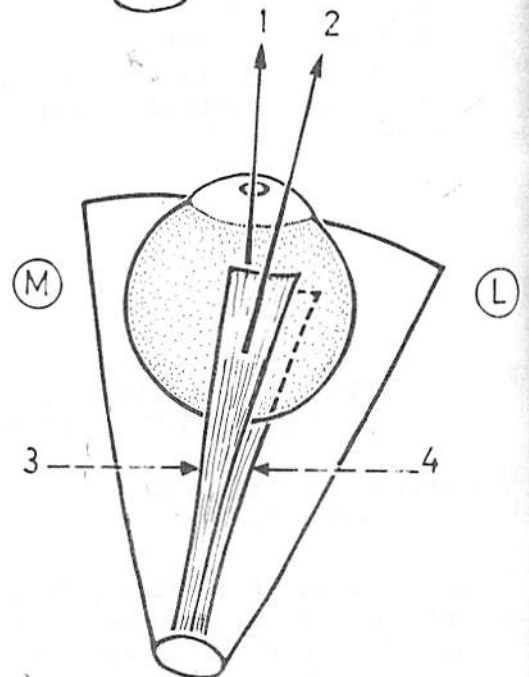




Fig.(286): ACTION OF SUPERIOR OBLIQUE

This muscle rotates the eyeball so that the cornea turns downwards and laterally.

1. line of pull of superior oblique.
2. deviation of the cornea downwards and laterally.
3. equator of the eyeball.

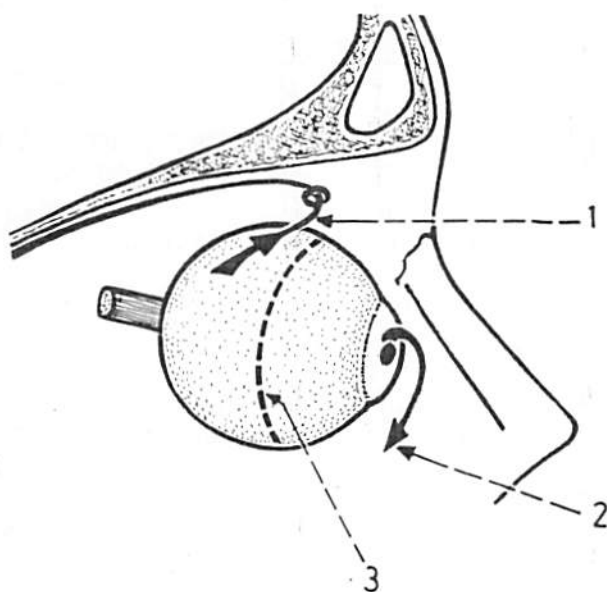


Fig.(287): ACTION OF INFERIOR OBLIQUE

This muscle rotates the eyeball so that the cornea turns upwards and laterally.

1. line of pull of inferior oblique.
2. deviation of the cornea upwards and laterally.

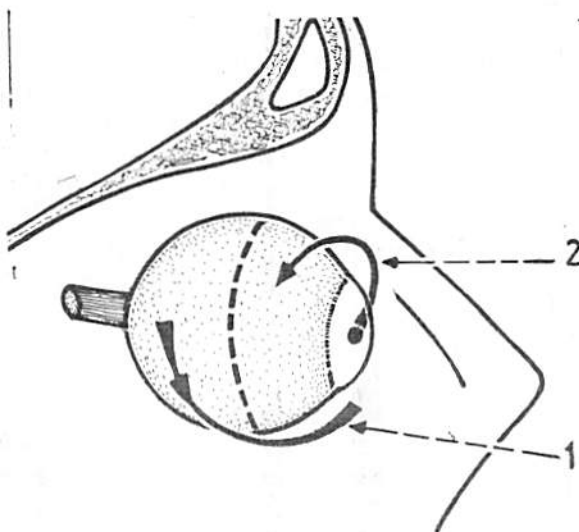
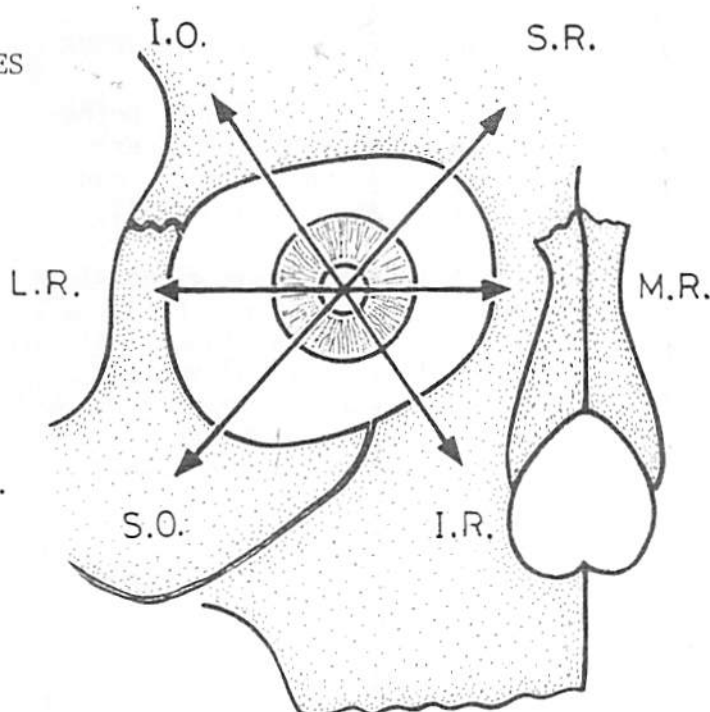


Fig.(288): ACTIONS OF EXTRAOCULAR MUSCLES

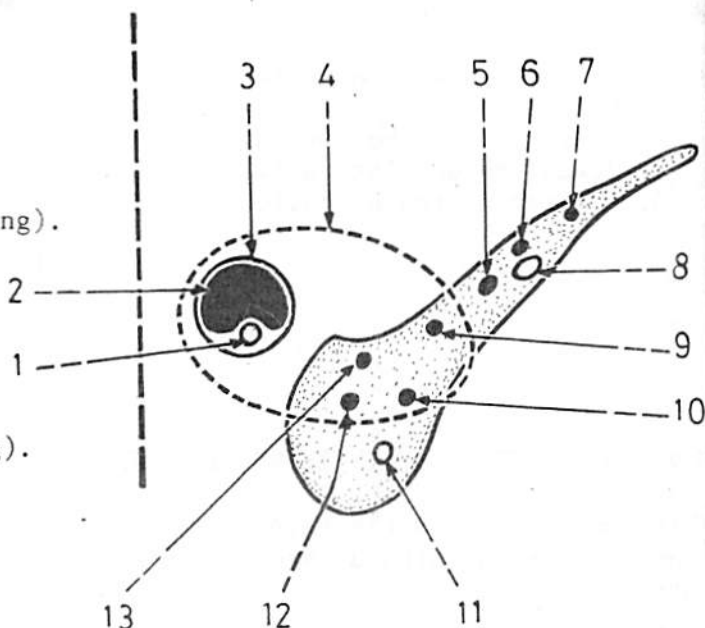
- \* L.R. (lateral rectus): lateral deviation of the cornea.
- \* M.R. (medial rectus): medial deviation of the cornea.
- \* S.R. (superior rectus): elevation and medial deviation of the cornea.
- \* I.R. (inferior rectus): depression and medial deviation of the cornea.
- \* I.O. (inferior oblique): elevation and lateral deviation of the cornea.
- \* S.O. (superior oblique): depression and lateral deviation of the cornea.
- \* To get pure elevation of the cornea the S.R. and I.O. must act together, and to get pure depression the I.R. and S.O. must act together.



# NERVES OF THE ORBIT

Fig.(289): STRUCTURES PASSING THROUGH THE OPTIC CANAL AND SUPERIOR ORBITAL FISSURE

1. ophthalmic artery (through the optic canal).
2. optic nerve (through the optic canal).
3. optic canal.
4. common tendinous ring.
5. trochlear nerve (through the fissure outside the tendinous ring).
6. frontal nerve (through the fissure outside the ring).
7. lacrimal nerve (through the fissure outside the ring).
8. superior ophthalmic vein.
9. superior division of oculomotor (within the tendinous ring).
10. abducent nerve (within the tendinous ring).
11. inferior ophthalmic vein (outside the ring).
12. inferior division of oculomotor (within the ring).
13. nasociliary nerve (within the ring).



\* The nerves passing through the superior orbital fissure are: oculomotor, trochlear, abducent and the 3 divisions of the ophthalmic nerve (lacrimal, frontal and nasociliary).

Fig.(290): BRANCHES OF OPHTHALMIC NERVE

The ophthalmic nerve divides just before entering the superior orbital fissure into 3 branches: lacrimal, frontal and nasociliary (from lateral to medial).

1. nasociliary nerve (runs along the medial wall of the orbit).
2. lacrimal nerve (runs along the lateral wall of the orbit to reach the lacrimal gland).
3. frontal nerve (runs midway between the lacrimal and nasociliary nerves).
4. maxillary nerve.
5. mandibular nerve.
6. trigeminal ganglion.
7. ophthalmic nerve.
8. optic nerve.

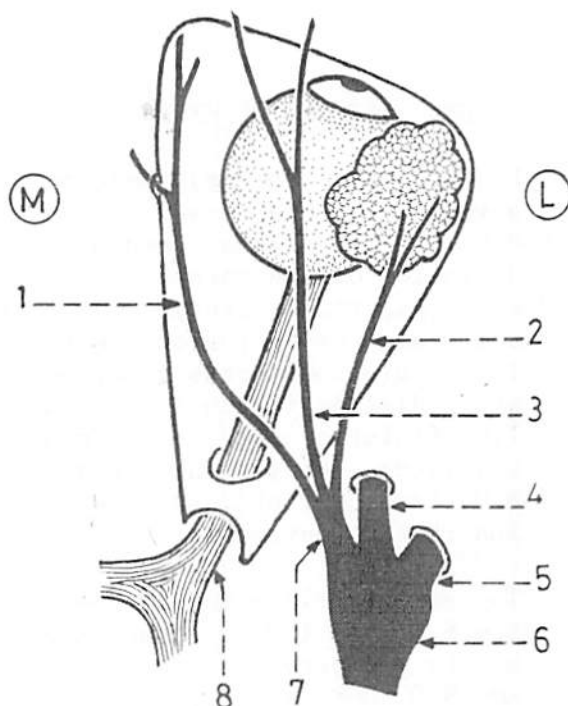


Fig.(291): NASOCILIARY NERVE

It crosses the optic nerve from lateral to medial and then runs forwards along the medial wall of the orbit just below the superior oblique muscle. It gives off the long ciliary nerves, posterior ethmoidal and anterior ethmoidal nerves, and a communicating branch to the ciliary ganglion. It ends as the infratrochlear nerve.

1. external nasal nerve (terminal part of the anterior ethmoidal nerve which emerges at the lower margin of the nasal bone).
2. anterior ethmoidal nerve (passes through the anterior ethmoidal canal).
3. posterior ethmoidal nerve (passes through the posterior ethmoidal canal).
4. nasociliary nerve (crosses over the optic nerve).
5. infratrochlear nerve (terminal part of the nasociliary which emerges from the orbit below the trochlea).
6. long ciliary nerves (2 to 3 in number and pierce the sclera).
7. short ciliary nerves (10 to 15 in number which arise from the ciliary ganglion and pierce the sclera).
8. ciliary ganglion.
9. optic nerve.

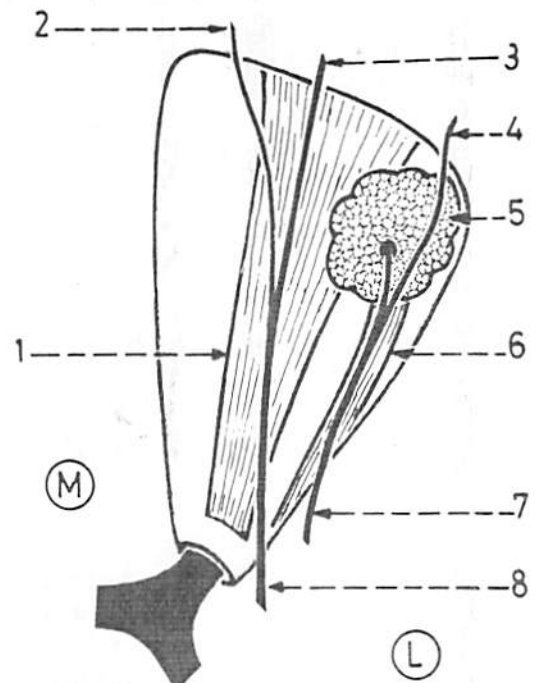
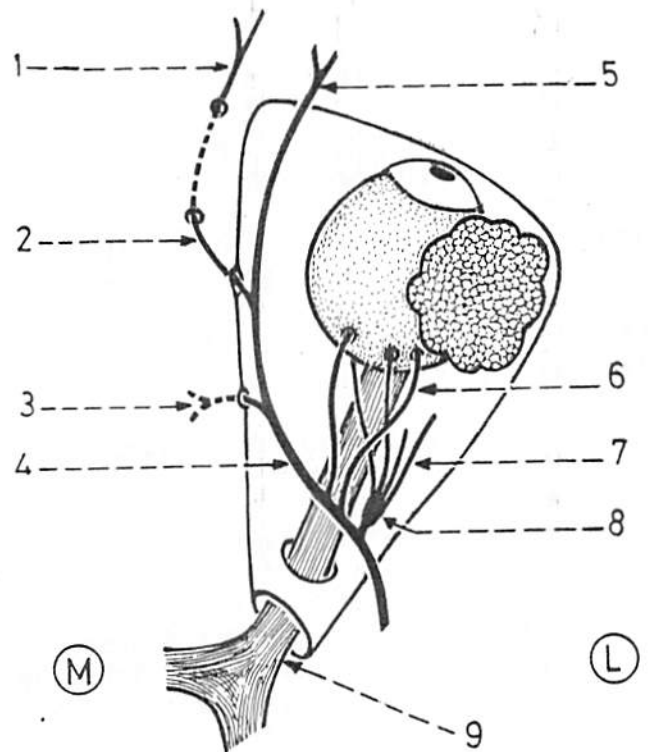


Fig.(292): FRONTAL AND LACRIMAL NERVES

1. levator palpebrae superioris.
2. supratrochlear nerve (a branch of the frontal nerve which runs above the trochlea).
3. supraorbital nerve (a branch of the frontal nerve which passes through the supraorbital notch or foramen).
4. terminal branch of lacrimal nerve to the skin of the upper eyelid.
5. lacrimal gland.
6. lateral rectus muscle.
7. lacrimal nerve (runs along the upper border of lateral rectus).
8. frontal nerve (runs forwards above the levator palpebrae superioris between it and the periosteum of the roof of the orbit).

Fig.(293): CUTANEOUS BRANCHES OF  
OPHTHALMIC NERVE

These are the terminal branches of the frontal (supraorbital and supratrochlear), nasociliary (infratrochlear and external nasal) and lacrimal (palpebral).

1. palpebral branch of lacrimal nerve (to the skin of upper eyelid).
2. external nasal branch (continuation of the anterior ethmoidal branch of nasociliary nerve; to the skin of the nose).
3. infratrochlear nerve (continuation of the nasociliary nerve; to the skin of the 2 eyelids and dorsum of the nose).
4. supratrochlear nerve (from the frontal nerve; to the skin of the forehead and scalp).
5. supraorbital nerve (from the frontal nerve; to the skin of the forehead and scalp).

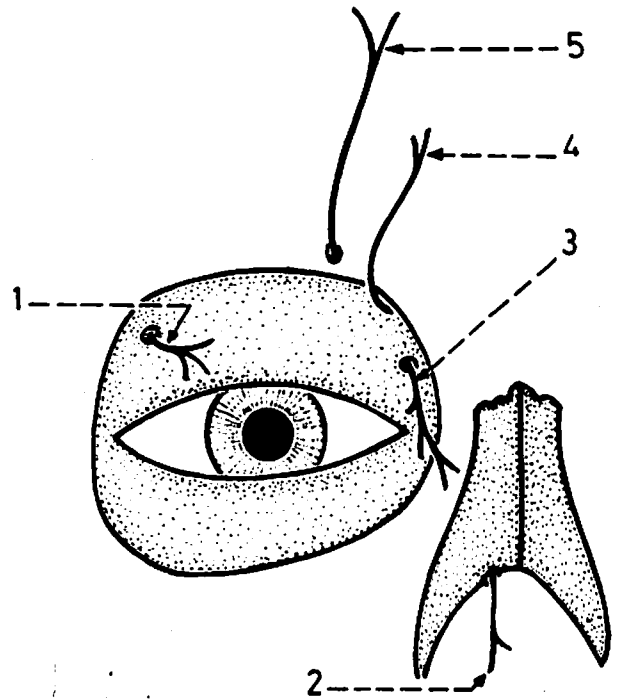


Fig.(294): OCULOMOTOR, TROCHLEAR  
AND ABDUCENT NERVES

These are the motor nerves to the extraocular muscles.

1. oculomotor nerve: divides into superior and inferior divisions which are distributed to all extraocular muscles except the superior oblique and lateral rectus.
2. superior oblique muscle (supplied by trochlear nerve).
3. lateral rectus muscle (supplied by abducent nerve).
4. abducent nerve: enters the ocular surface of the lateral rectus.
5. trochlear nerve: crosses above the optic nerve to reach the medial wall of the orbit where it ends in the superior oblique muscle.

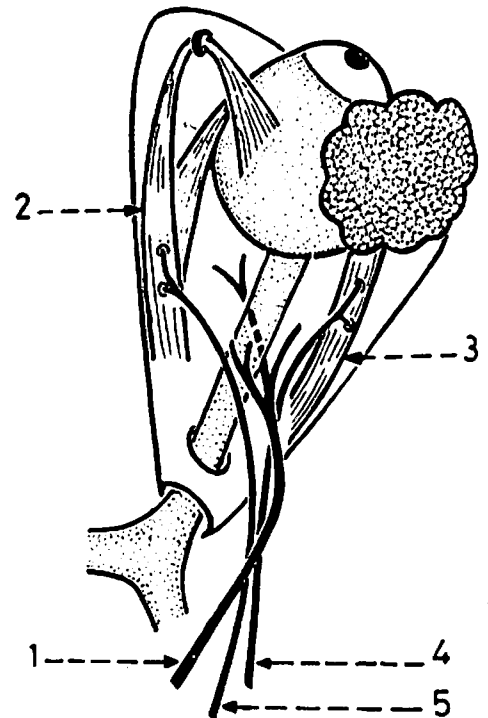


Fig.(295): CILIARY GANGLION

It is a parasympathetic ganglion situated near the apex of the orbit just lateral to the optic nerve. It is suspended from the nasociliary nerve and gives off 10 - 15 short ciliary nerves which enter the back of the sclera.

1. short ciliary nerves (postganglionic parasympathetic branches).
2. ciliary ganglion.
3. nasociliary nerve.
4. optic nerve.

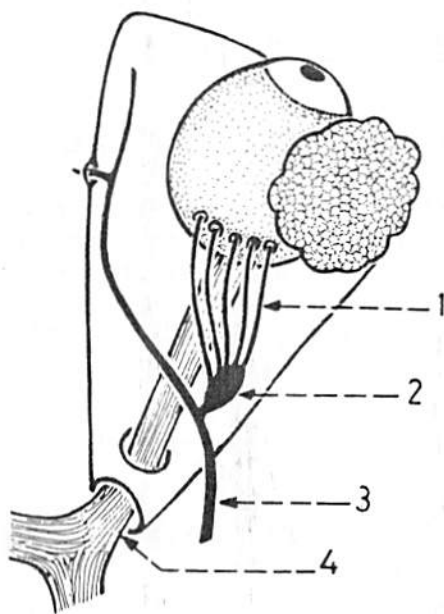
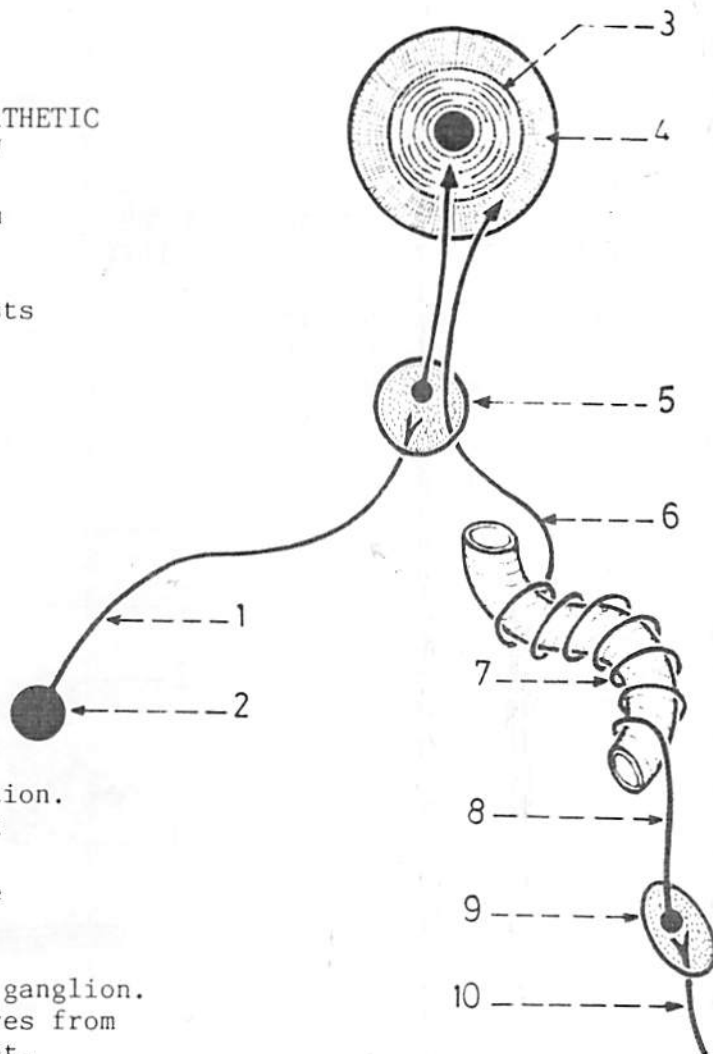


Fig.(296): SYMPATHETIC AND PARASYMPATHETIC ROOTS OF CILIARY GANGLION

The sympathetic root is derived from the internal carotid plexus. The parasympathetic root is derived from the oculomotor nerve and consists of preganglionic fibres which arise from Edinger-Westphal nucleus.

1. parasympathetic root (relays in the ganglion).
2. Edinger-Westphal nucleus.
3. constrictor pupillae muscle (supplied by parasympathetic fibres).
4. dilator pupillae muscle (supplied by sympathetic fibres).
5. ciliary ganglion.
6. sympathetic root (traverses the ganglion without interruption).
7. internal carotid plexus around the internal carotid artery.
8. postganglionic fibres from the superior cervical sympathetic ganglion.
9. superior cervical sympathetic ganglion.
10. preganglionic sympathetic fibres from the 1st thoracic spinal segment.



## VESSELS OF THE ORBIT

Fig.(297): COURSE OF OPHTHALMIC ARTERY

It arises from the internal carotid artery and enters the orbit through the optic canal. It crosses over the optic nerve from lateral to medial in company with the nasociliary nerve to reach the medial wall of the orbit.

1. medial wall of the orbit.
2. lacrimal gland.
3. optic nerve.
4. ophthalmic artery crossing over the optic nerve.
5. nasociliary nerve.
6. internal carotid artery.

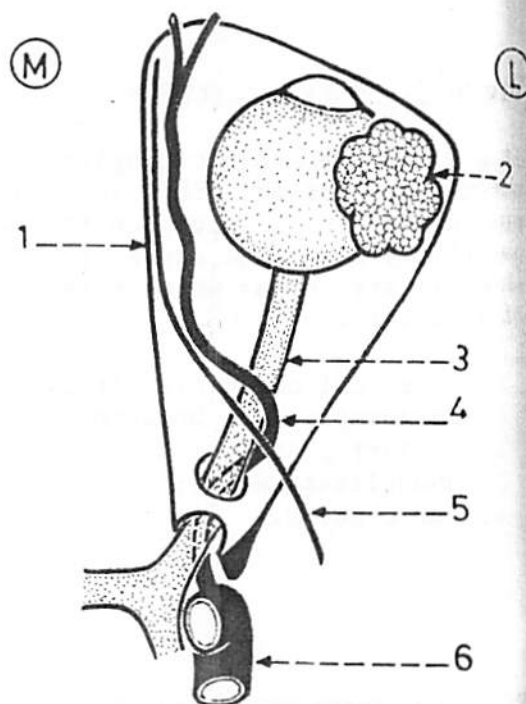


Fig.(298): RELATIONS OF OPHTHALMIC ARTERY ON THE MEDIAL WALL OF THE ORBIT

It runs forwards in company with the nasociliary nerve between the superior oblique above and the medial rectus below. It ends by dividing into supratrochlear and dorsal nasal branches.

1. medial rectus muscle.
2. ophthalmic artery.
3. nasociliary nerve.
4. superior oblique muscle.
5. supratrochlear artery.
6. dorsal nasal artery.

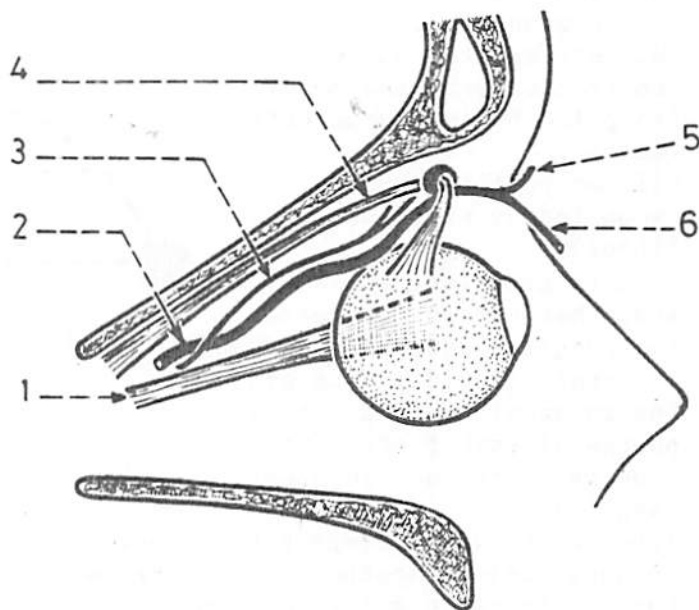




Fig.(299): BRANCHES OF OPHTHALMIC ARTERY

It gives off the central artery of the retina, lacrimal, posterior ciliary, supraorbital, anterior and posterior ethmoidal and 2 terminal branches (supratrochlear and dorsal nasal).

1. supratrochlear artery.
2. dorsal nasal artery.
3. anterior ethmoidal artery.
4. ophthalmic artery along the medial wall of the orbit.
5. posterior ethmoidal artery.
6. central artery of retina.
7. ophthalmic artery below the optic nerve in the optic canal.
8. medial palpebral arteries (from the termination of the ophthalmic artery).
9. supraorbital artery.
10. lateral palpebral arteries (from the lacrimal artery).
11. posterior ciliary arteries (pierce the back of the sclera).
12. lacrimal artery (along the lateral wall of the orbit).
13. ophthalmic artery crossing over the optic nerve.

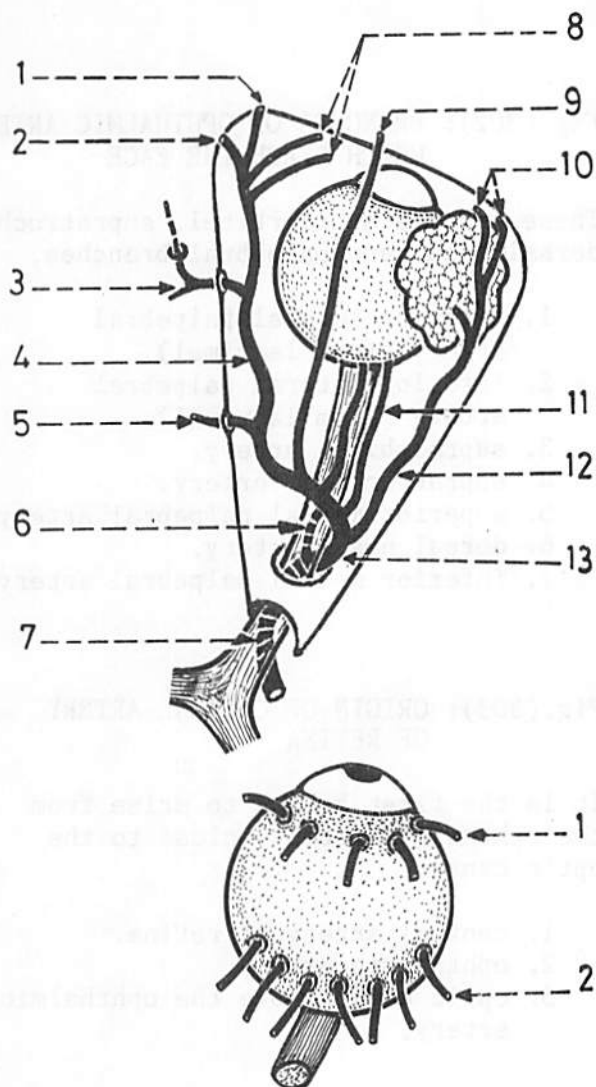


Fig.(300): CILIARY ARTERIES

These are anterior and posterior ciliary arteries which pierce the sclera.

1. anterior ciliary arteries: pierce the sclera near the margin of the cornea.
2. posterior ciliary arteries: pierce the sclera around the optic nerve.

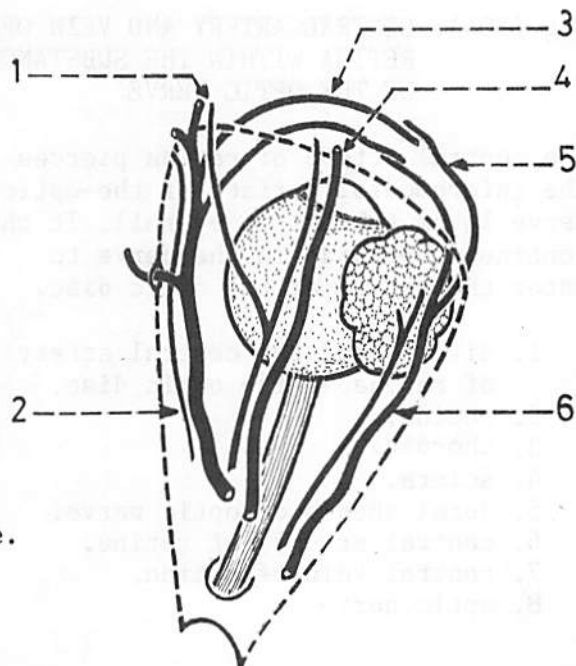


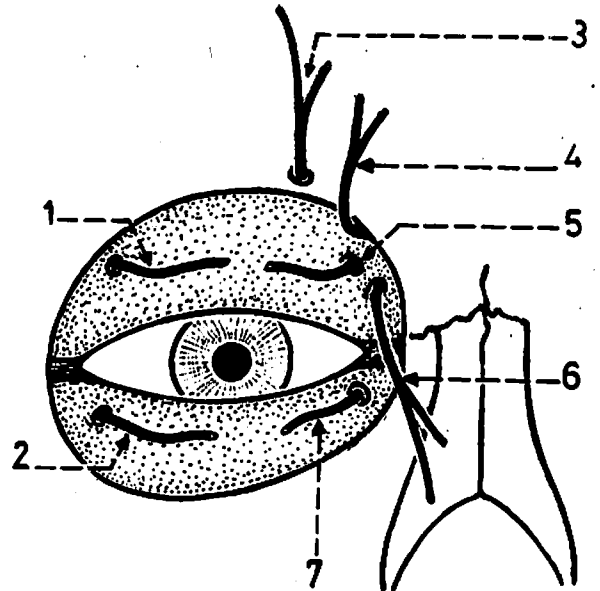
Fig.(301): NERVES IN COMPANY WITH BRANCHES OF OPHTHALMIC ARTERY

1. supratrochlear artery and nerve.
2. ophthalmic artery and nasociliary nerve.
3. medial palpebral branches.
4. supra-orbital artery and nerve.
5. lateral palpebral arteries.
6. lacrimal artery and nerve.

**Fig.(302): BRANCHES OF OPHTHALMIC ARTERY WHICH REACH THE FACE**

These are the supraorbital, supratrochlear, dorsal nasal and palpebral branches.

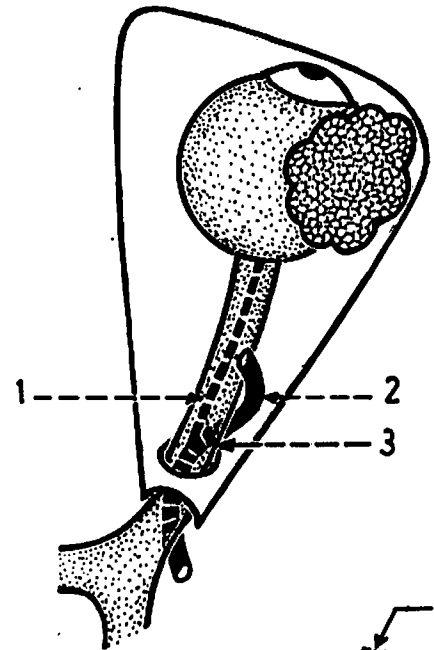
1. superior lateral palpebral artery (from lacrimal).
2. inferior lateral palpebral artery (from lacrimal).
3. supraorbital artery.
4. supratrochlear artery.
5. superior medial palpebral artery.
6. dorsal nasal artery.
7. inferior medial palpebral artery.



**Fig.(303): ORIGIN OF CENTRAL ARTERY OF RETINA**

It is the first branch to arise from the ophthalmic artery, close to the optic canal.

1. central artery of retina.
2. ophthalmic artery.
3. optic nerve above the ophthalmic artery.



**Fig.(304): CENTRAL ARTERY AND VEIN OF RETINA WITHIN THE SUBSTANCE OF THE OPTIC NERVE**

The central artery of retina pierces the inferomedial surface of the optic nerve  $1\frac{1}{2}$  cm behind the eyeball. It then continues forwards in the nerve to enter the retina at the optic disc.

1. division of the central artery of retina at the optic disc.
2. retina.
3. choroid.
4. sclera.
5. dural sheath of optic nerve.
6. central artery of retina.
7. central vein of retina.
8. optic nerve.

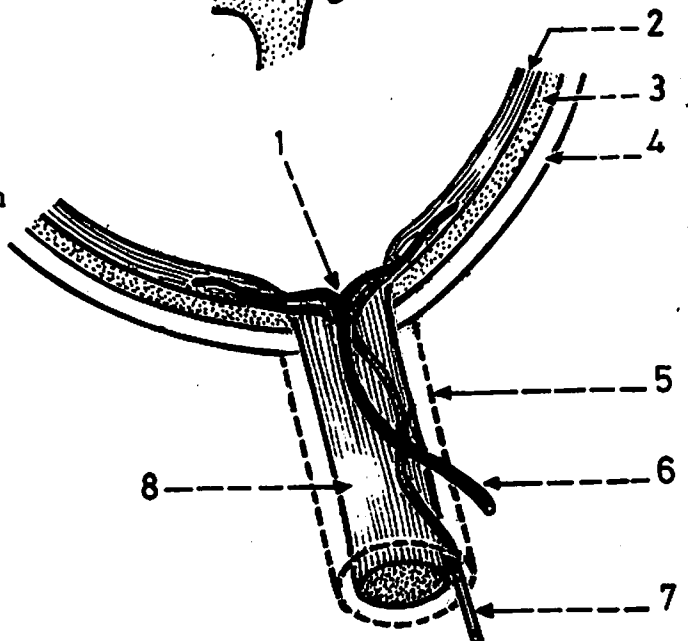
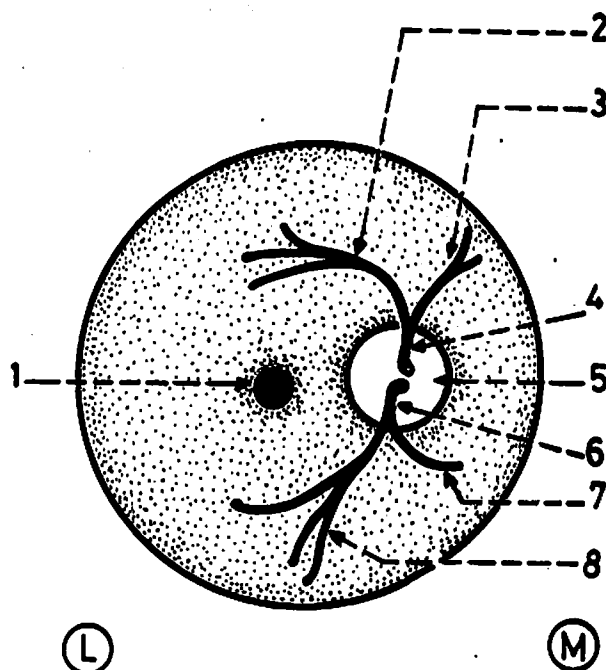




Fig.(305): TERMINAL DIVISIONS OF CENTRAL ARTERY OF THE RETINA  
(seen by ophthalmoscope)

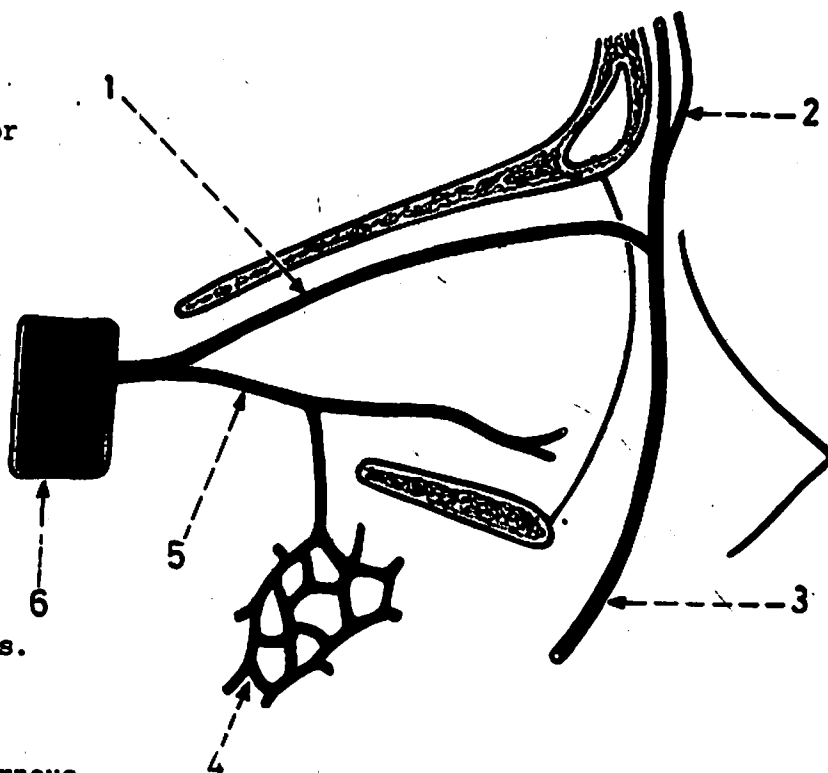
It divides at the optic disc into a superior branch and an inferior branch. Each branch divides further into temporal and nasal branches.



1. macula lutea (lateral to the optic disc).
2. temporal branch of superior division.
3. nasal branch of superior division.
4. superior division of central artery.
5. optic disc.
6. inferior division of central artery.
7. nasal branch of inferior division.
8. temporal branch of inferior division.

Fig.(306): OPHTHALMIC VEINS

These are superior and inferior veins which frequently join each other to open into the cavernous sinus.



1. superior ophthalmic vein (begins at the medial part of the upper eyelid where it communicates with the facial vein; it accompanies the ophthalmic artery).
2. supraorbital and supra-trochlear veins uniting to form the facial vein.
3. facial vein in the face.
4. pterygoid plexus of veins.
5. inferior ophthalmic vein (runs along the floor of the orbit and may open separately into the cavernous sinus; it communicates with the pterygoid plexus of veins by an emissary vein which passes through the inferior orbital fissure).
6. cavernous sinus.

LACRIMAL APPARATUS

Fig.(307): PARTS OF LACRIMAL APPARATUS

These are the lacrimal gland (secretes tears), lacrimal canaliculi, lacrimal sac and nasolacrimal duct which opens into the inferior meatus of the nasal cavity.

1. lacrimal gland (lies in the lacrimal fossa in the anterolateral part of the roof of the orbit).
2. lacrimal canaliculus (superior).
3. lacrimal sac (lies in the nasolacrimal groove and receives the 2 lacrimal canaliculi).
4. nasolacrimal duct.
5. lacrimal canaliculus (inferior).

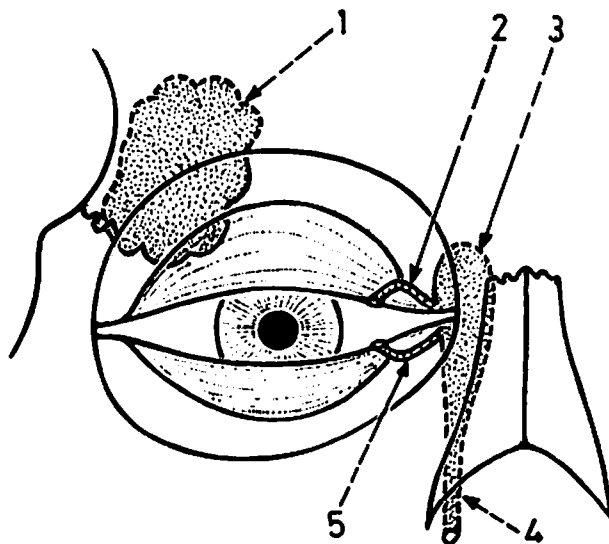


Fig.(308): OPENINGS OF LACRIMAL CANALICULI

The lacrimal canaliculi open on the medial ends of the margins of the 2 eyelids, one canaliculus on each eyelid. Each opening (punctum) lies on the surface of a conical elevation called lacrimal papilla.

1. superior lacrimal papilla.
2. lacrimal caruncle.
3. inferior lacrimal papilla.
4. edge of lower eyelid.

\* The opening of the lacrimal canaliculus on the lacrimal papilla is called lacrimal punctum.

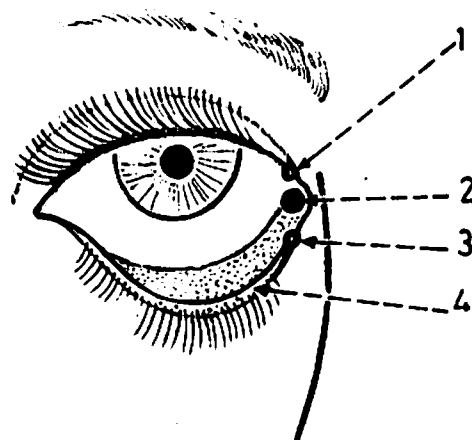


Fig.(309): PARTS OF LACRIMAL GLAND

The gland consists of an orbital part (in lacrimal fossa) and a palpebral part (in upper eyelid).

1. levator palpebrae superioris dividing the lacrimal gland into 2 parts.
2. orbital part of the gland.
3. palpebral part of the gland.
4. tarsus of upper eyelid.
5. conjunctival sac.

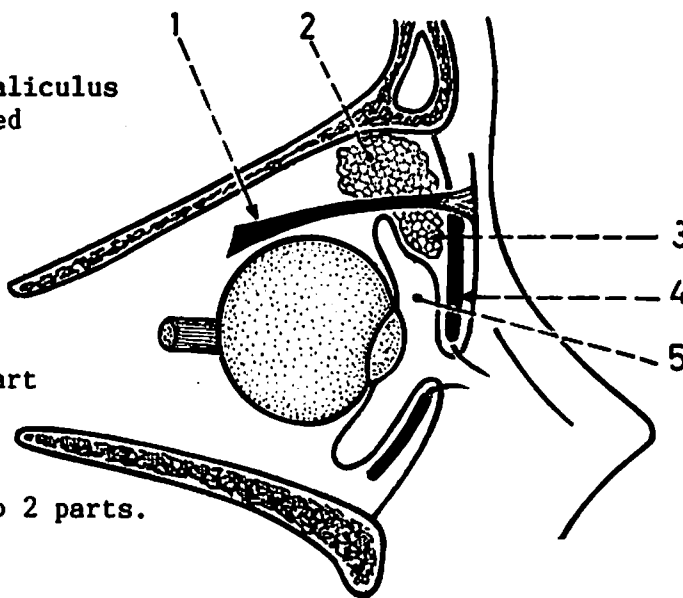


Fig.(310):RELATION OF LACRIMAL GLAND  
TO LEVATOR PALPEBRAE SUPERIORIS

The gland is divided partially by the lateral margin of the levator palpebrae superioris into a larger orbital part and a smaller palpebral part.

1. orbital part of the gland.
2. palpebral part (opens into the conjunctival sac by 10 - 15 ducts).
3. aponeurosis of levator palpebrae superioris.

\* Excision of the palpebral part deprives the whole gland from its ducts.

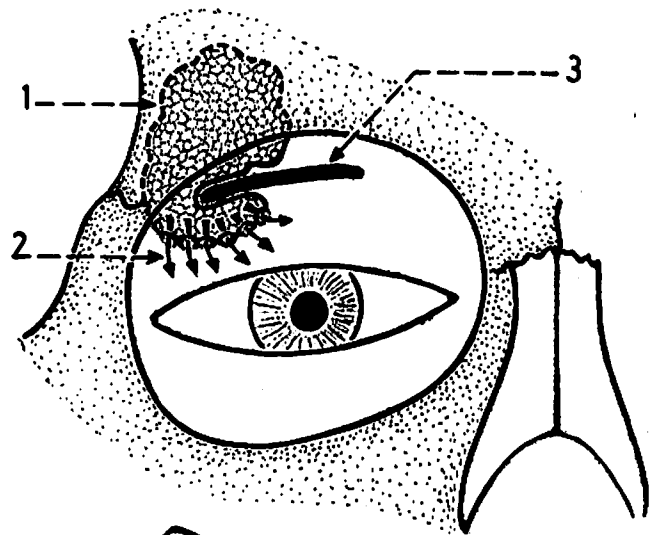


Fig.(311): BLOOD AND NERVE SUPPLY  
OF LACRIMAL GLAND

1. lacrimal artery (from the ophthalmic artery).
2. lateral rectus muscle.
3. lacrimal gland.
4. lacrimal nerve (from the ophthalmic nerve).
5. communication between the lacrimal nerve and zygomatic nerve.

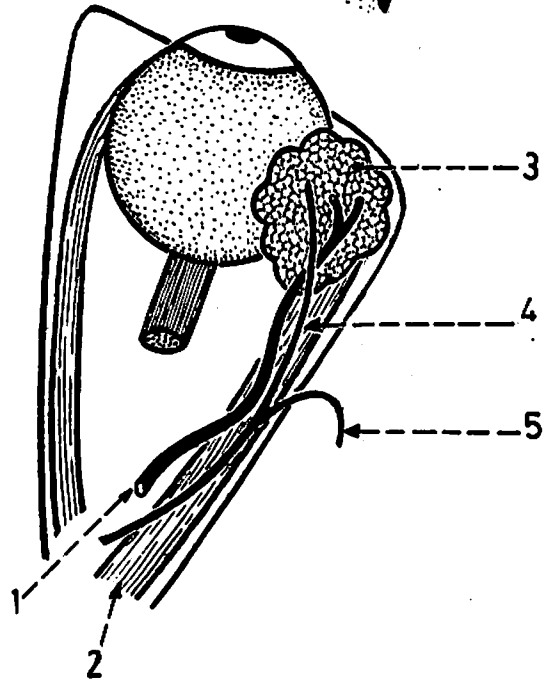


Fig.(312): PARASYMPATHETIC SUPPLY  
OF LACRIMAL GLAND

The parasympathetic fibres to the gland arise in the superior salivary nucleus and leave the facial nerve in the greater petrosal nerve. This nerve relays in the pterygopalatine ganglion where postganglionic fibres arise and pass into the zygomatic nerve. These fibres reach the lacrimal nerve through a communication with the zygomatic nerve.

1. lower eyelid.
2. upper eyelid.
3. lacrimal gland.
4. lacrimal nerve.
5. communication between the 2 nerves.
6. zygomatic nerve.

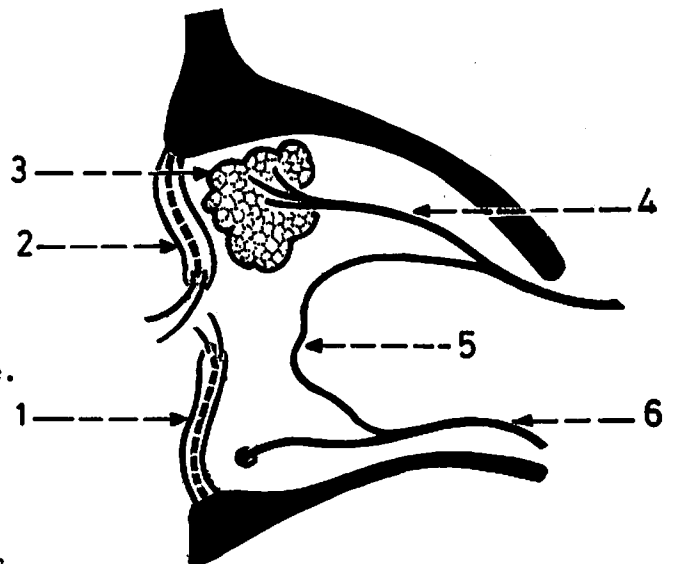
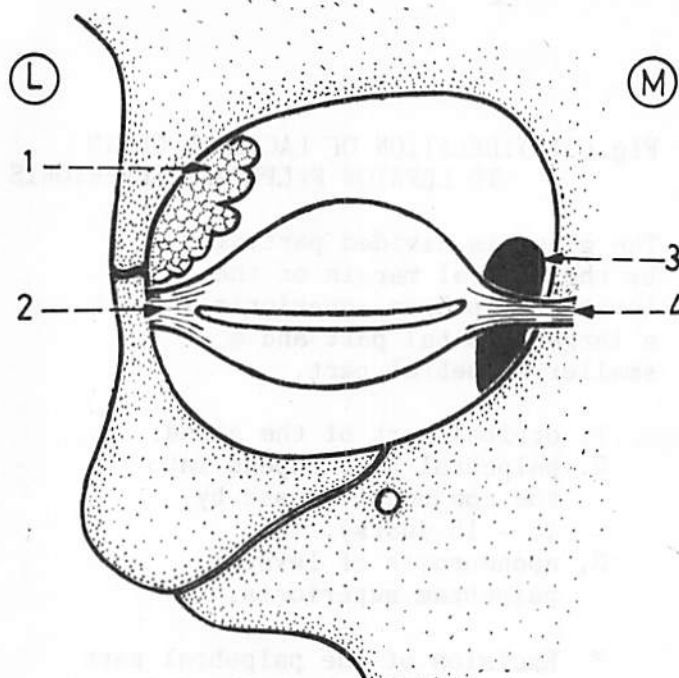


Fig.(313): POSITION OF LACRIMAL SAC

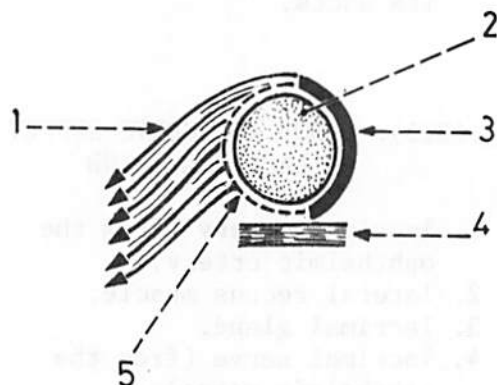
It lies in the nasolacrimal groove just behind the medial palpebral ligament.

1. lacrimal gland.
2. lateral palpebral ligament.
3. lacrimal sac.
4. medial palpebral ligament.

Fig.(314): LACRIMAL SAC  
(transverse section)

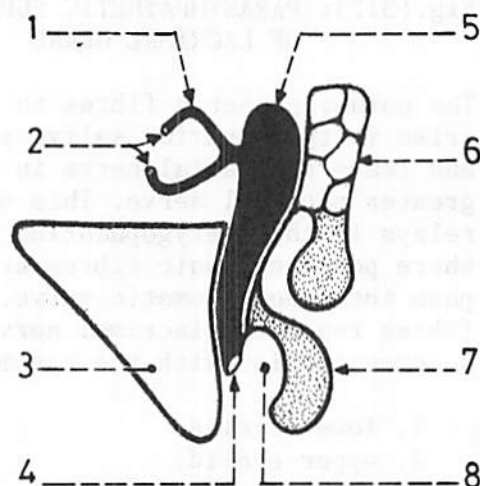
The sac is covered by lacrimal fascia which gives origin to the lacrimal part of the orbicularis oculi muscle.

1. lacrimal part of orbicularis oculi muscle (arises from the lacrimal fascia and posterior lacrimal crest).
2. lacrimal sac (T.S.).
3. nasolacrimal groove.
4. medial palpebral ligament (in front of the sac).
5. lacrimal fascia.

Fig.(315): LACRIMAL SAC AND ITS  
NASOLACRIMAL DUCT

The sac receives the 2 lacrimal canaliculi a little below its upper end. The duct lies between the lateral wall of the nose medially and maxillary air sinus laterally.

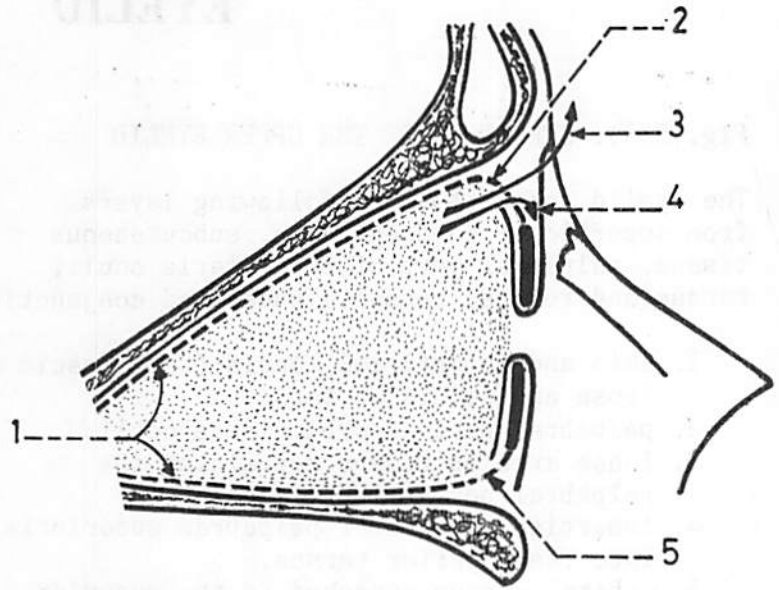
1. superior canaliculus.
2. lacrimal puncta.
3. maxillary air sinus.
4. opening of nasolacrimal duct.
5. lacrimal sac.
6. anterior ethmoidal sinus.
7. inferior nasal concha.
8. inferior nasal meatus.



ORBITAL FASCIA

Fig.(316): PERIOSTEUM AND ORBITAL SEPTUM

The periosteum is loosely connected to the bones of the orbit. It is continuous at the orbital margins with the orbital septum. This septum is a membranous sheet extending from the orbital margins to the tarsi of both eyelids.



1. orbital periosteum.
2. orbital septum attached to the tarsus of upper eyelid.
3. nerves and vessels piercing the orbital septum to reach the face.
4. slip of levator palpebrae superioris piercing the septum to reach the skin of eyelid.
5. orbital septum attached to the tarsus of lower eyelid.

\* The periosteum, orbital septum and the 2 tarsi form together a fascial cone around the orbital contents.

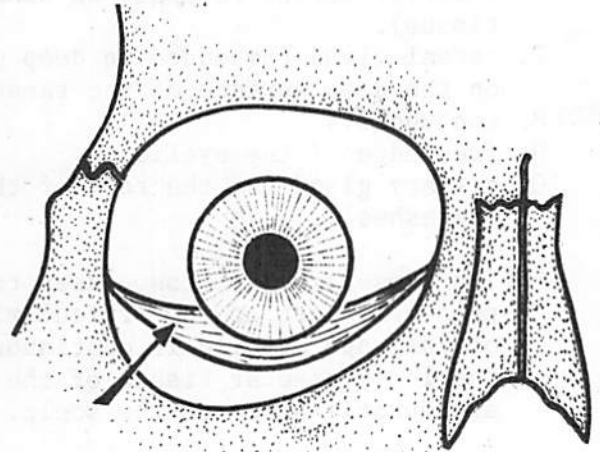
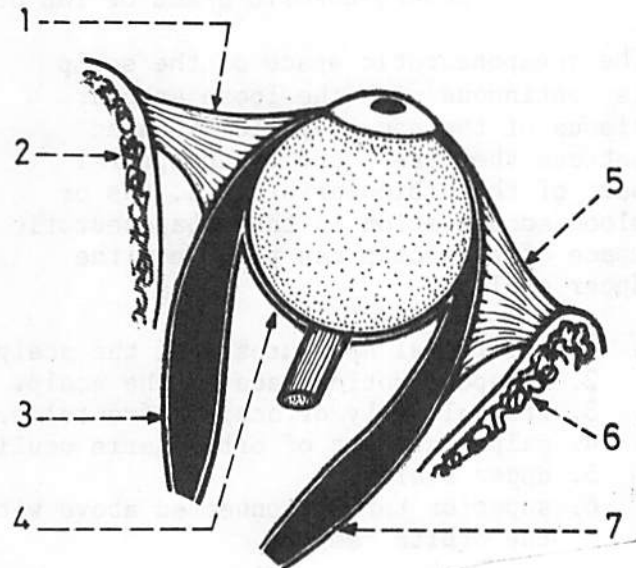


Fig.(317): SUSPENSORY LIGAMENT OF EYEBALL

It is a fascial band which extends from side to side below the eyeball.

Fig.(318): FASCIAL SHEATH OF EYEBALL AND ITS EXPANSIONS

The eyeball is enveloped by a fascial sheath which gives tubular sheaths for the extraocular muscles. The sheaths of the medial and lateral recti give side expansions to the medial and lateral walls anteriorly called check ligaments.



1. medial check ligament.
2. lacrimal bone.
3. sheath of medial rectus.
4. fascial sheath of eyeball.
5. lateral check ligament.
6. zygomatic bone.
7. sheath of lateral rectus.

## EYELID

Fig.(319): STRUCTURE OF THE UPPER EYELID

The eyelid consists of the following layers from superficial to deep: skin, subcutaneous tissue, palpebral part of orbicularis oculi, tarsus (and related tarsal glands) and conjunctiva.

1. skin and superficial fascia (this fascia is loose and devoid of fat).
2. palpebral part of orbicularis oculi.
3. loose areolar tissue containing the palpebral nerves and vessels.
4. insertion of levator palpebrae superioris into the superior tarsus.
5. orbital septum attached to the superior tarsus.
6. superior tarsus (a plate of dense fibrous tissue).
7. tarsal gland (embedded in deep groove on the deep surface of the tarsus).
8. conjunctiva.
9. free edge of the eyelid.
10. ciliary gland (at the root of the eyelashes).

\* The loose areolar tissue deep to the palpebral part of the orbicularis oculi of the upper eyelid is continuous with the loose areolar tissue of the subaponeurotic space of the scalp.

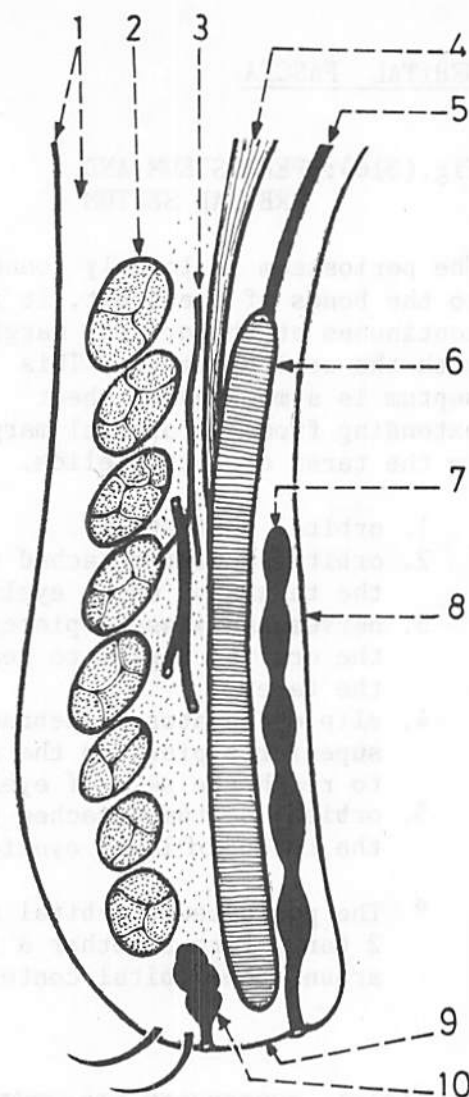


Fig.(320): RELATION BETWEEN THE UPPER EYELID AND SUBAPONEUROTIC SPACE OF THE SCALP

The subaponeurotic space of the scalp is continuous with the loose areolar tissue of the upper eyelid situated between the tarsus and the palpebral part of the orbicularis oculi. Pus or blood accumulation in the subaponeurotic space of the scalp can pass into the upper eyelid.

1. epicranial aponeurosis of the scalp.
2. subaponeurotic space of the scalp.
3. frontal belly of occipitofrontalis.
4. palpebral part of orbicularis oculi.
5. upper eyelid.
6. superior tarsus connected above with the orbital septum.

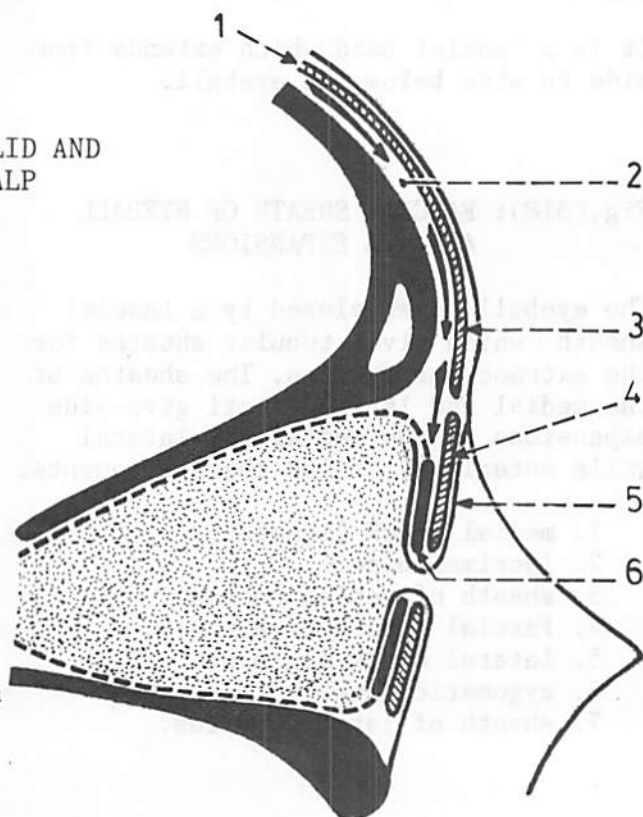




Fig.(321): PALPEBRAL PART OF ORBICULARIS OCULI

It lies in the upper and lower lids. Its fibres arise from the medial palpebral ligament medially and pass laterally in each eyelid to decussate together at the lateral palpebral raphe.

1. part of the muscle in the upper eyelid.
2. lateral palpebral raphe.
3. part of the muscle in the lower eyelid.
4. medial palpebral ligament.

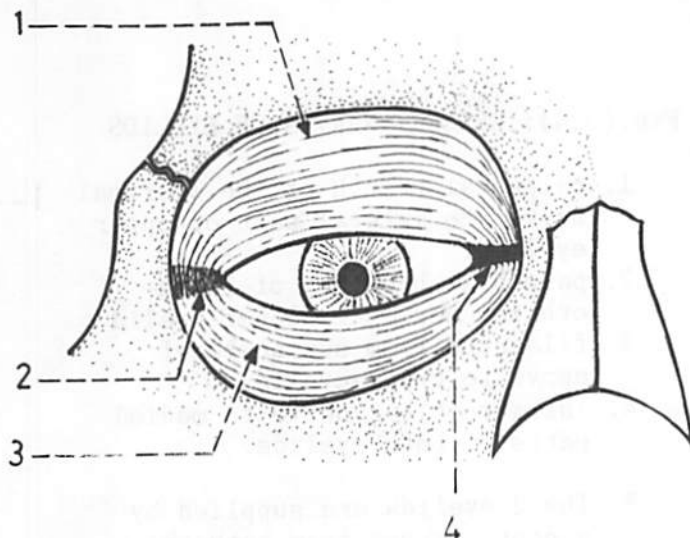


Fig.(322): ORBITAL SEPTUM AND THE TWO TARSI

The orbital septum is a fascial septum which extends from the margins of the orbit to the 2 tarsi, thus closing the orbital opening.

1. superior orbital margin.
2. upper part of the orbital septum.
3. superior tarsus.
4. lacrimal sac.
5. lateral palpebral ligament (connecting the 2 tarsi to the lateral orbital margin).
6. lower part of orbital septum.
7. inferior tarsus.
8. infraorbital margin.
9. palpebral fissure (between the 2 tarsi).
10. medial palpebral ligament (connecting the 2 tarsi to the medial orbital margin).

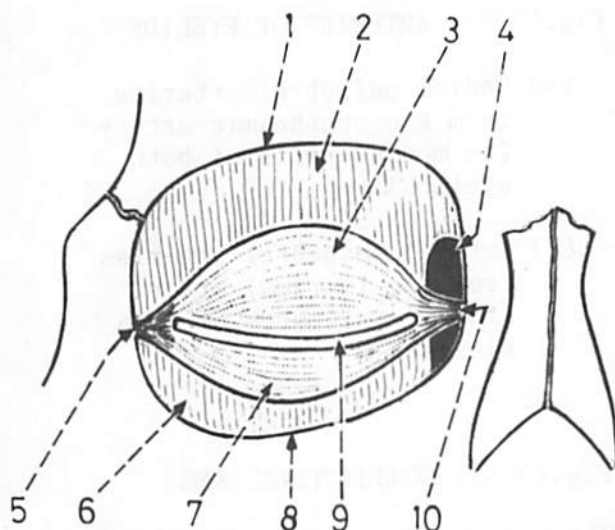


Fig.(323): STRUCTURES AT THE MEDIAL ANGLE OF THE EYE

1. lateral angle of the eye.
2. openings of tarsal glands.
3. plica semilunaris.
4. superior lacrimal punctum and papilla.
5. lacrimal caruncle.
6. lacus lacrimalis.
7. inferior lacrimal punctum and papilla.

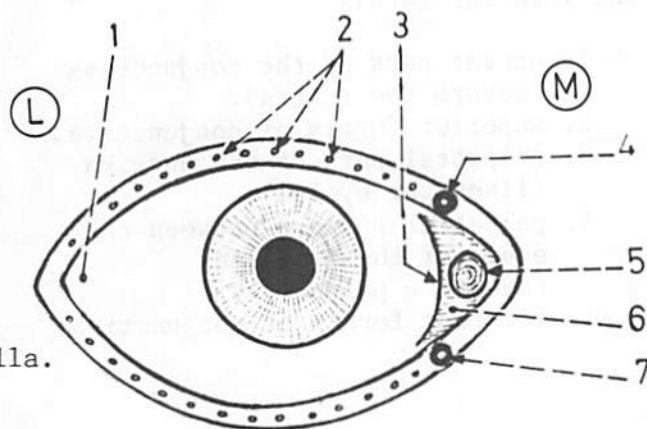


Fig.(324): SENSORY NERVES OF EYELIDS

1. palpebral branch of the lacrimal nerve to lateral part of upper eyelid .
2. palpebral branches of infra-orbital nerve to lower eyelid .
3. filaments from supraorbital nerve to upper eyelid.
4. infratrochlear nerve to medial parts of both eyelids.

\* The 2 eyelids are supplied by sensory nerves from both the ophthalmic and maxillary nerves.

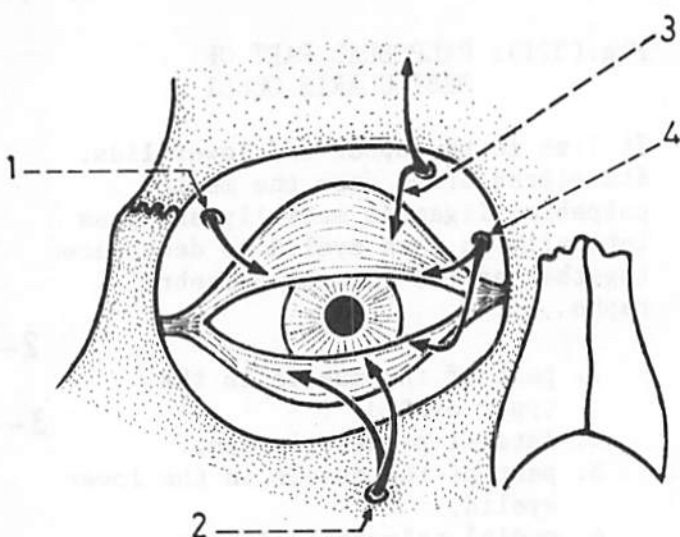


Fig.(325): ARTERIES OF EYELIDS

- (a) Medial palpebral arteries from the ophthalmic artery (to medial parts of both eyelids).
- (b) Lateral palpebral arteries from the lacrimal artery (to lateral parts of both eyelids).

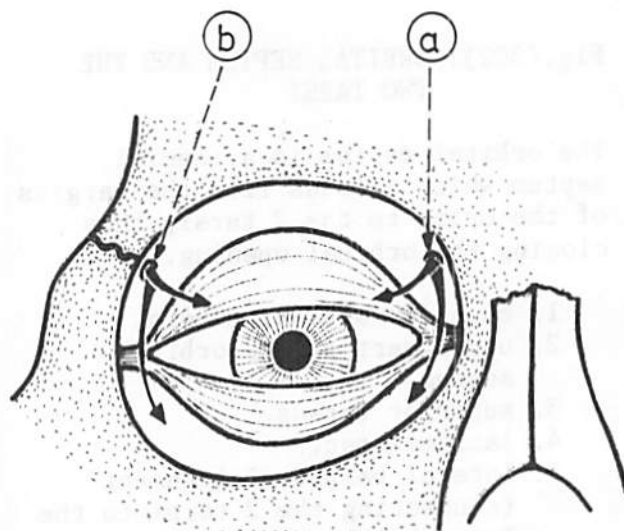
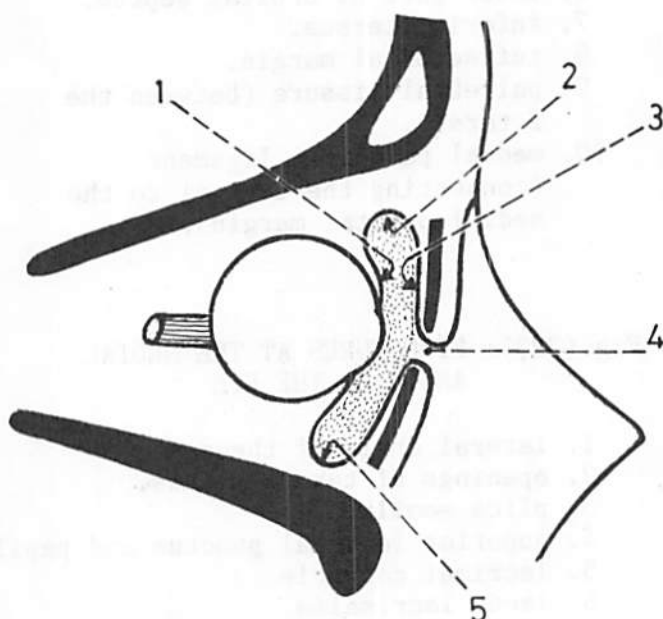


Fig.(326): CONJUNCTIVAL SAC

The conjunctiva is a mucous membrane which lines the upper and lower eyelids and is reflected over the front of the sclera. The line of reflection above is called the superior fornix, while the line of reflection below is called the inferior fornix.

1. ocular part of the conjunctiva (covers the sclera).
2. superior fornix of conjunctiva.
3. palpebral part of conjunctiva (lines the eyelid).
4. palpebral fissure between the edges of the 2 eyelids (eyelid = palpebra).
5. inferior fornix of conjunctiva.





# POSTERIOR TRIANGLE OF THE NECK

Fig. (327): BOUNDARIES AND SUBDIVISIONS

The posterior triangle is bounded in front by the sternomastoid, behind by the trapezius, and below by the middle 1/3 of the clavicle. It is subdivided by the inferior belly of omohyoid into 2 triangles: occipital triangle above and supraclavicular triangle below.

1. trapezius muscle.
2. inferior belly of omohyoid.
3. apex of the triangle.
4. occipital triangle.
5. superior belly of omohyoid.
6. sternomastoid muscle.
7. base of the triangle (middle 1/3 of the clavicle).
8. supraclavicular triangle.

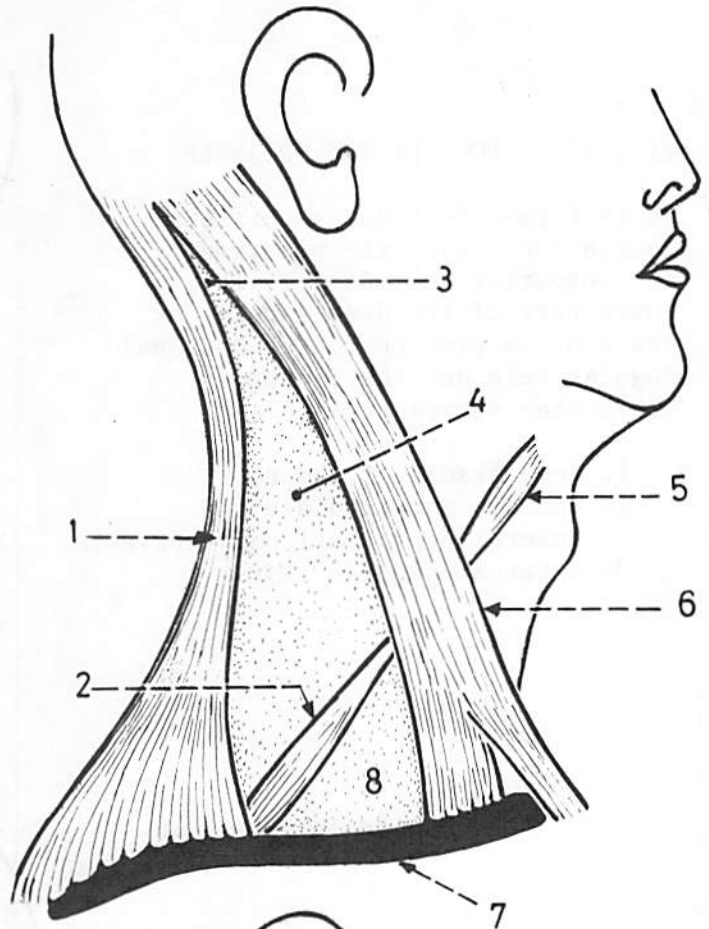


Fig.(328): FLOOR OF THE TRIANGLE

It is formed by the following muscles from below upwards: scalenus medius, levator scapulae, splenius capitis and sometimes a part of the semispinalis capitis at the apex of the triangle. This muscular floor is covered by the prevertebral fascia.

1. semispinalis capitis (at the apex of the triangle but may not appear in the floor).
2. splenius capitis.
3. levator scapulae.
4. trapezius.
5. scalenus medius.
6. sternomastoid.

\* The scalenus anterior does not appear in the floor of the triangle because it lies completely under cover of the sternomastoid muscle.

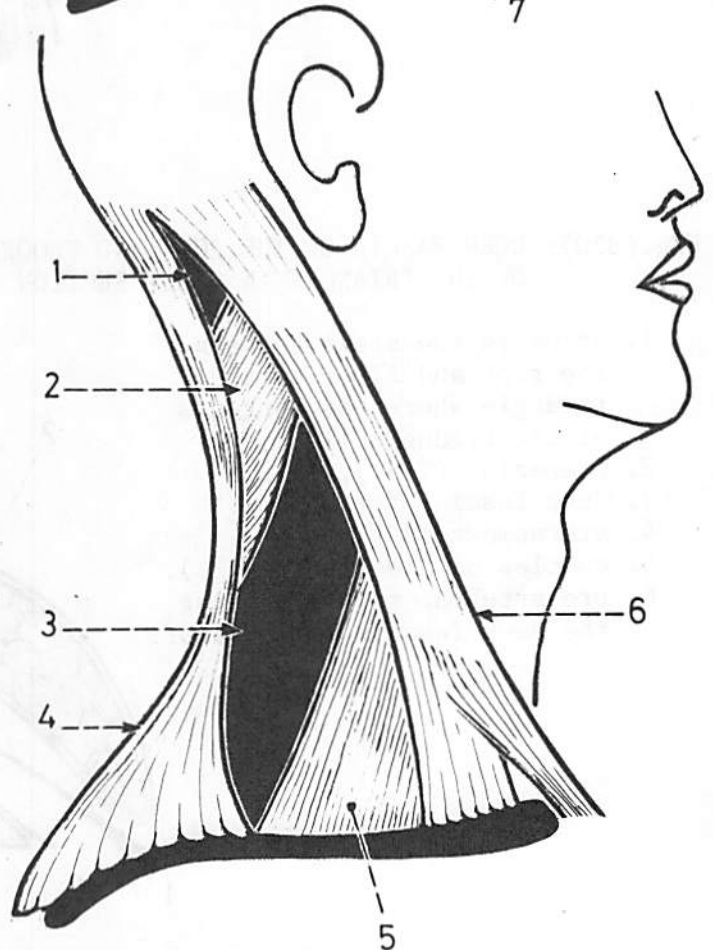


Fig.(329): ROOF OF THE TRIANGLE

It is formed by skin, superficial fascia containing the platysma and investing deep fascia. The lower part of the deep fascia of the roof is pierced by the external jugular vein and the 3 supra-clavicular nerves.

1. deep fascia of the roof.
2. medial, intermediate and lateral supraclavicular nerves.
3. external jugular vein.

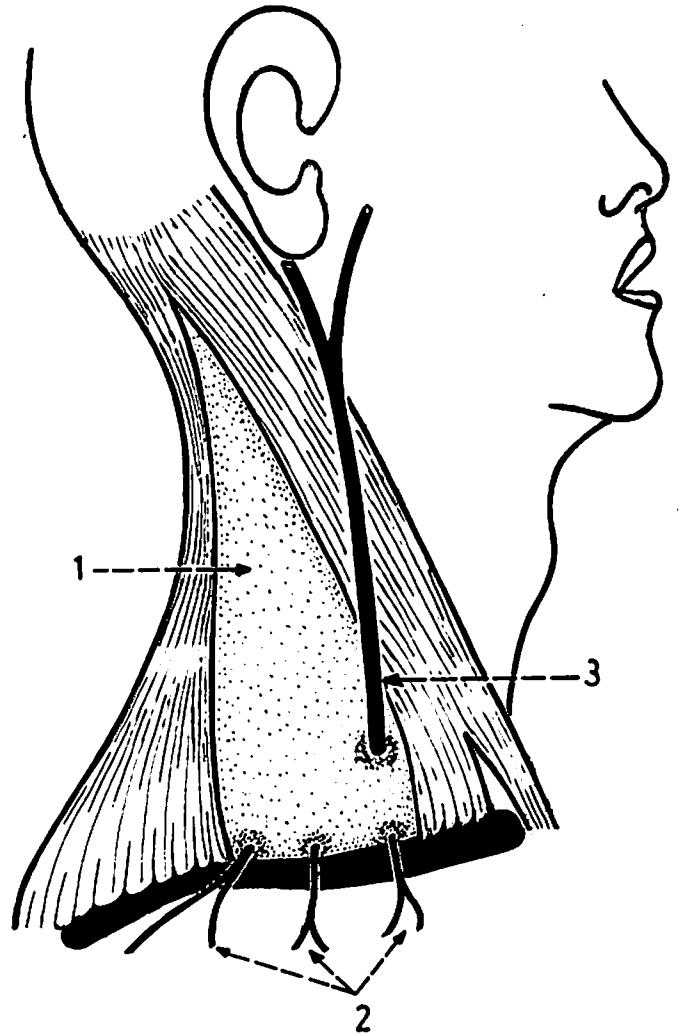


Fig.(330): DEEP FASCIA OF THE ROOF AND FLOOR OF THE TRIANGLE IN CROSS SECTION

1. arrow in the space between the roof and floor of the triangle where the contents of the triangle lie.
2. trapezius (T.S.).
3. deep fascia of the roof.
4. sternomastoid (T.S.).
5. muscles of the floor (T.S.).
6. prevertebral fascia forming the deep fascia of the floor.

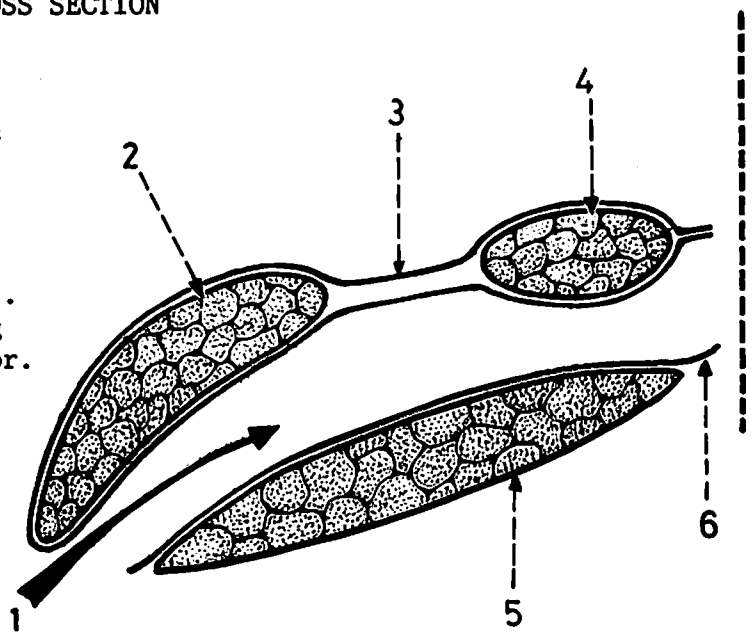


Fig.(331): ACCESSORY NERVE AND BRANCHES OF CERVICAL PLEXUS IN THE TRIANGLE

The accessory nerve appears at the middle of the posterior border of sternomastoid, crosses the triangle on the levator scapulae to disappear deep to the trapezius 5 cm above the clavicle.

The branches of the cervical plexus appear at the middle of the posterior border of the sternomastoid and spread upwards (3 branches) and downwards (3 branches).

1. lesser occipital nerve (ascends along the posterior border of sternomastoid).
2. accessory nerve (spinal root).
3. great auricular nerve (ascends obliquely over the sternomastoid towards the angle of the mandible).
4. transverse cutaneous nerve of neck (runs forwards across the sternomastoid).
5. medial, intermediate and lateral supraclavicular nerves (descend to cross over the clavicle).

\* The 3 branches of cervical plexus which run upwards are lesser occipital, great auricular and transverse cutaneous of neck, while the 3 branches which run downwards are the supraclavicular nerves.

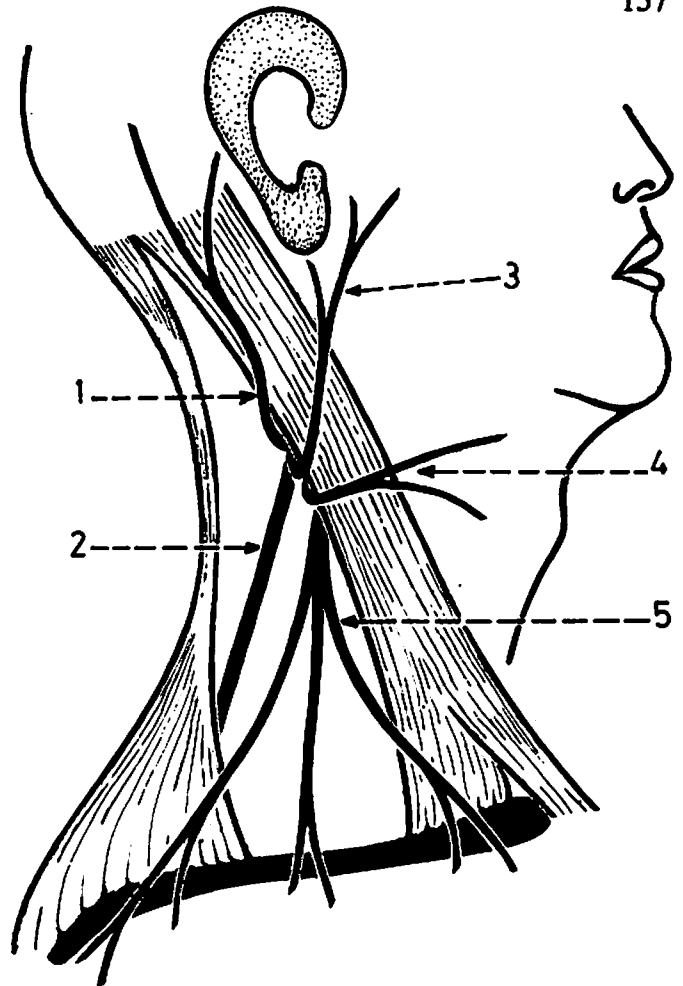
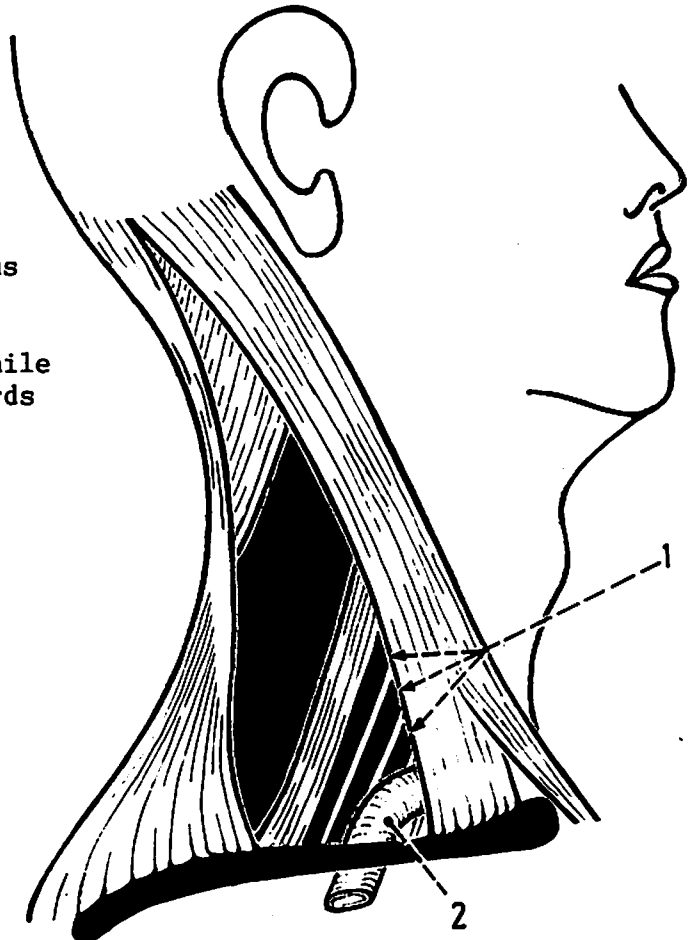


Fig.(332): TRUNKS OF BRACHIAL PLEXUS IN THE TRIANGLE

These are the upper, middle and lower trunks which lie partly above and partly behind the 3rd part of subclavian artery.

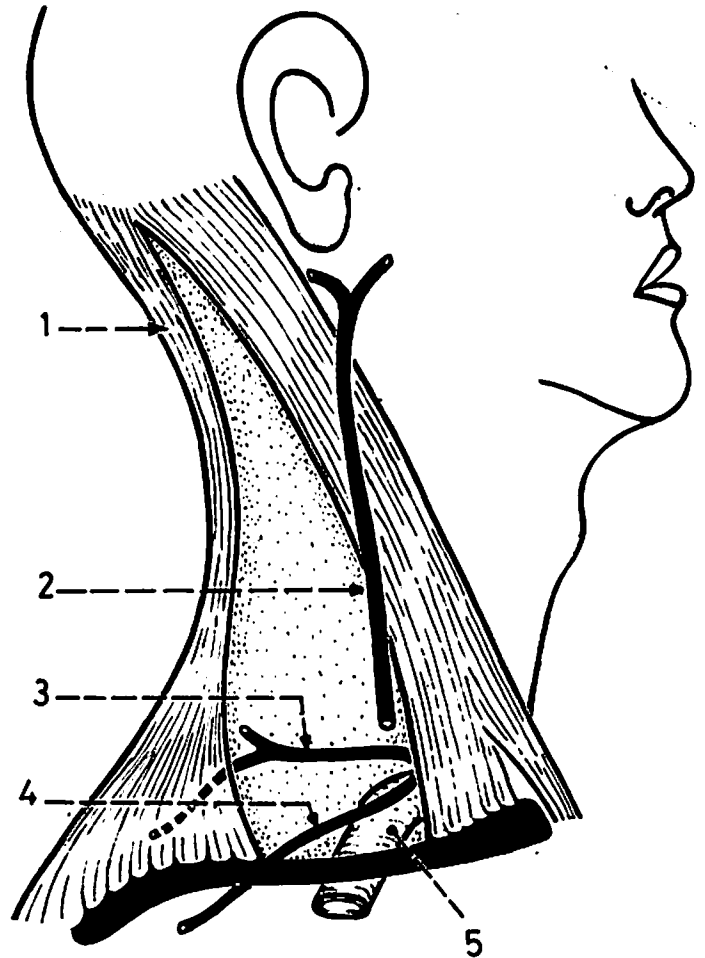
1. trunks of brachial plexus (in the antero-inferior part of the triangle).
2. 3rd part of subclavian artery.



**Fig.(333): VESSELS IN THE POSTERIOR TRIANGLE**

These are the 3rd part of subclavian artery, transverse cervical artery, suprascapular artery and lower part of external jugular vein and its tributaries (transverse cervical and suprascapular veins). All these vessels lie in the lower part of the triangle.

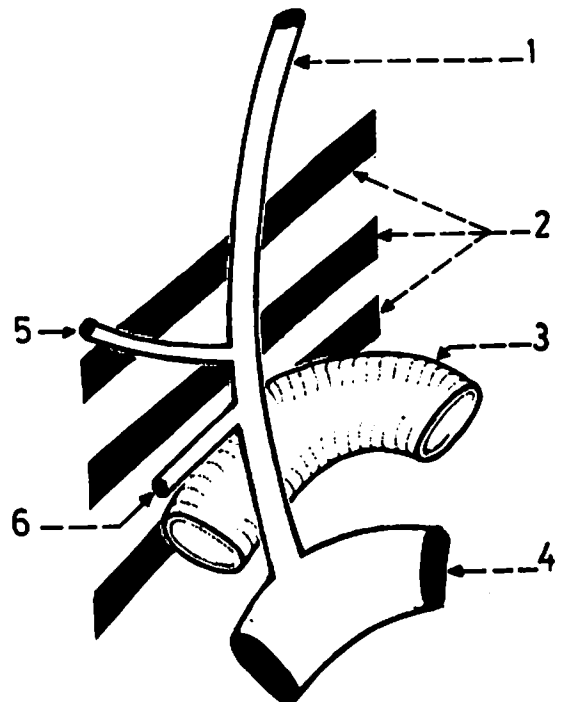
1. trapezius.
2. external jugular vein.
3. transverse cervical artery.
4. suprascapular artery.
5. 3rd part of subclavian artery (at the antero-inferior angle of the triangle).



**Fig.(334): THE PART OF EXTERNAL JUGULAR VEIN IN THE TRIANGLE**

The vein descends in the triangle behind the sternomastoid and superficial to the brachial plexus and subclavian artery to end in the subclavian vein. It receives the transverse cervical and suprascapular veins.

1. external jugular vein.
2. upper, middle and lower trunks of brachial plexus.
3. 3rd part of subclavian artery.
4. subclavian vein.
5. transverse cervical vein.
6. suprascapular vein.



## BACK OF THE NECK

Fig.(335): 1st LAYER OF MUSCLES  
OF THE BACK OF THE NECK

It consists of one muscle only which is the trapezius.

1. sternomastoid attached to the lateral part of superior nuchal line.
2. trapezius attached to the medial part of superior nuchal line, external occipital protuberance and ligamentum nuchae.

\* The muscles of the back of the neck are arranged in 4 layers.

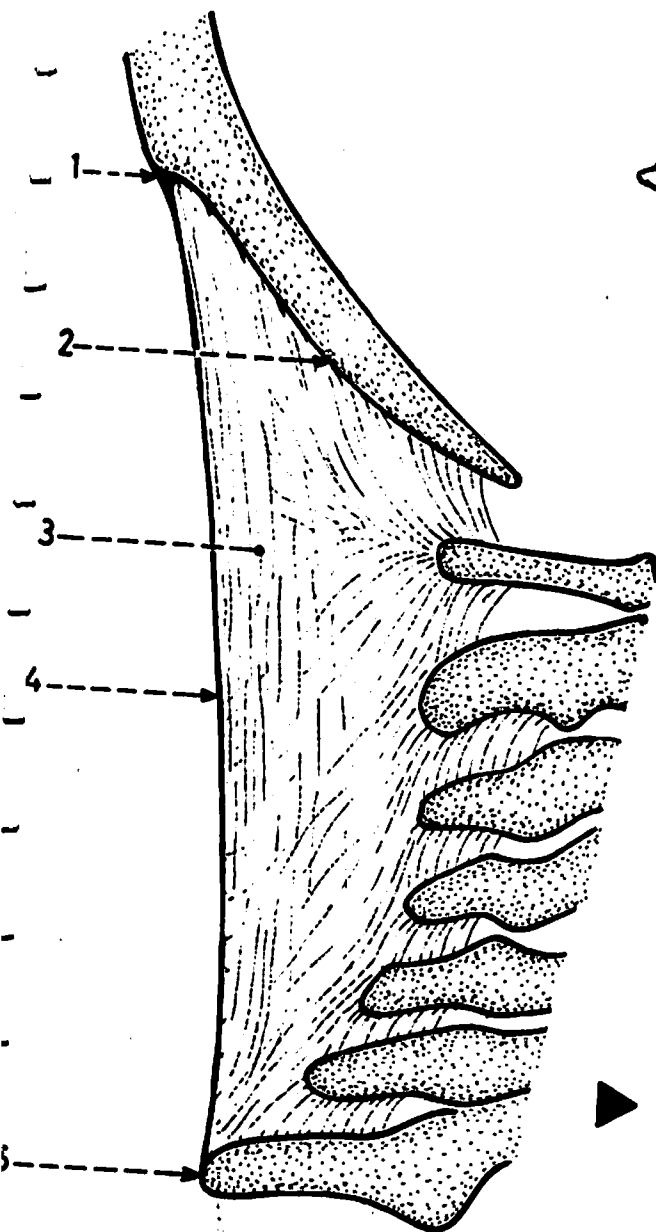
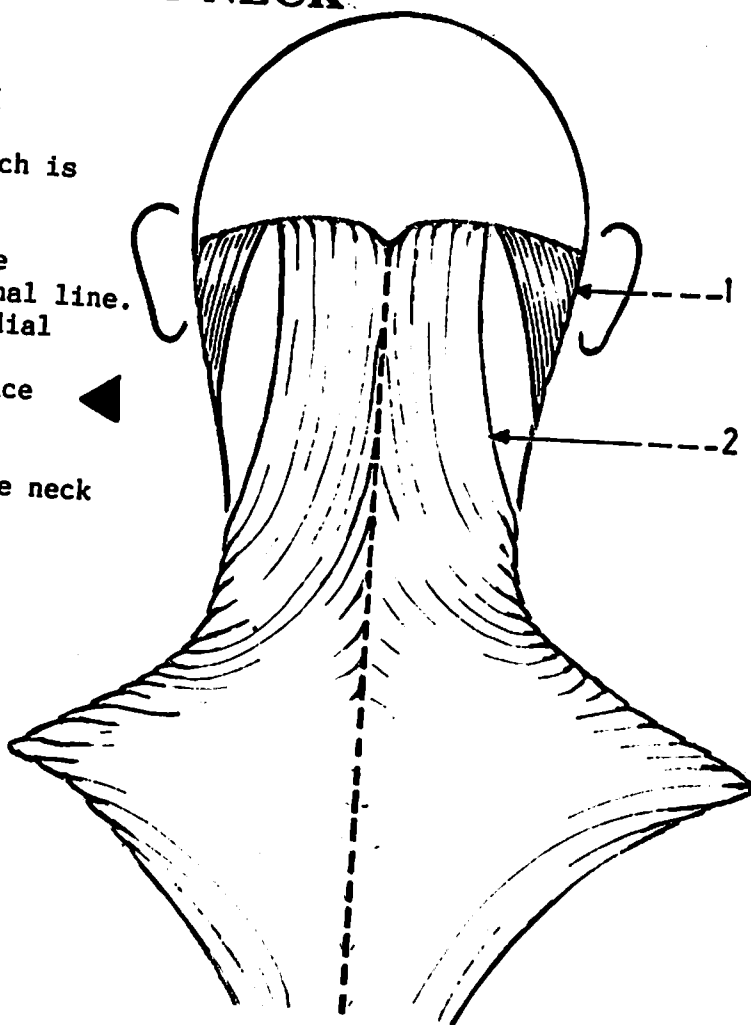


Fig.(336): LIGAMENTUM NUCHAE  
(side view)

It is a fibrous partition present in the midline of the back of the neck extending from the external occipital protuberance and crest above to the spine of the 7th cervical vertebra below. It forms an intermuscular septum between the muscles of the 2 sides of the back of the neck.

1. external occipital protuberance.
2. external occipital crest.
3. ligamentum nuchae.
4. free posterior border of the ligament.
5. spine of the 7th cervical vertebra.

Fig.(337): 2nd LAYER OF MUSCLES  
OF THE BACK OF THE NECK

It is formed by the splenius capitis and splenius cervicis.

1. semispinalis capitis (belongs to the 3rd layer).
2. ligamentum nuchae.
3. splenius capitis (its fibres run upwards and laterally to get inserted deep to the sternomastoid into the mastoid process and into the area below the superior nuchal line).
4. sternomastoid (cut).
5. splenius cervicis (just below the splenius capitis and fused with it; it is inserted into the transverse processes of the 2nd and 3rd cervical vertebrae under cover of the levator scapulae).
6. levator scapulae.
7. trapezius (cut).

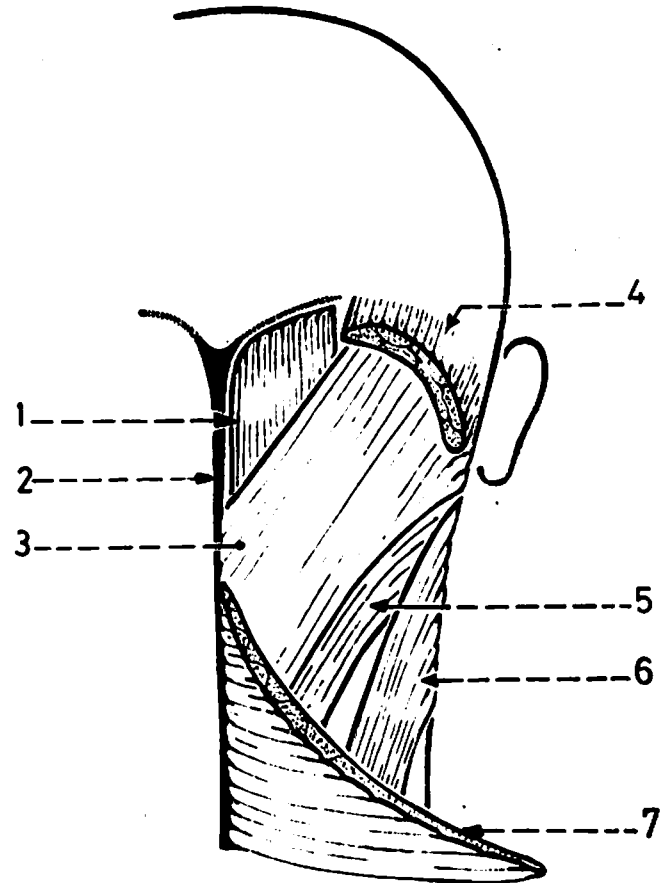


Fig.(338): 3rd LAYER OF MUSCLES  
OF THE BACK OF THE NECK

It is formed by the semispinalis capitis and the 2 longissimus muscles (capitis and cervicis).

1. splenius capitis (cut).
2. external occipital protuberance.
3. semispinalis capitis (ascends parallel to the midline under cover of the splenius capitis).
4. lower part of splenius capitis.
5. trapezius (cut).
6. sternomastoid (cut).
7. longissimus capitis (ascends upwards and laterally lateral to the semispinalis capitis).
8. longissimus cervicis (lateral to the longissimus capitis and fused with it).

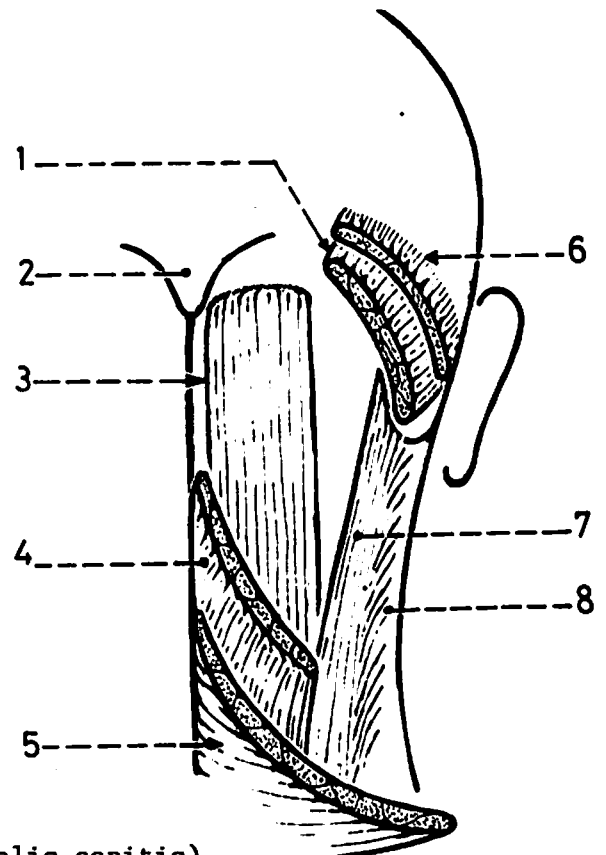
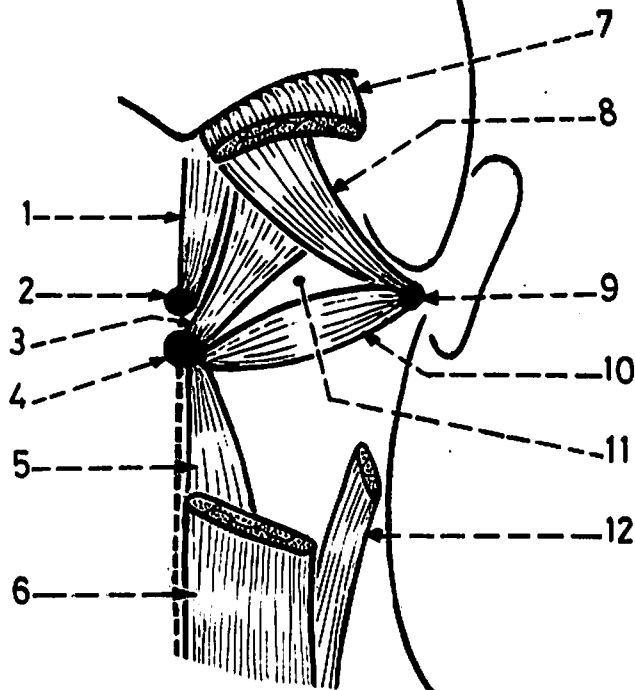


Fig.(339): 4th LAYER OF MUSCLES  
OF THE BACK OF THE NECK.

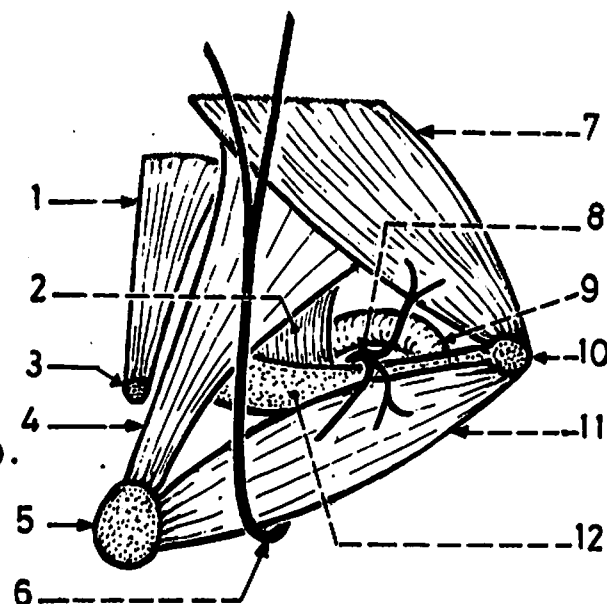
These are short muscles which form the boundaries of the suboccipital triangle. They are the rectus capitis posterior major, rectus capitis posterior minor, inferior oblique and superior oblique.



1. rectus capitis posterior minor.
2. spine of 1st cervical vertebra.
3. rectus capitis posterior major.
4. spine of 2nd cervical vertebra.
5. semispinalis cervicis (forms part of the 4th layer and lies deep to the semispinalis capitis).
6. semispinalis capitis.
7. semispinalis capitis (cut).
8. superior oblique.
9. transverse process of atlas vertebra.
10. inferior oblique.
11. suboccipital triangle.
12. longissimus capitis.

Fig.(340): BOUNDARIES AND CONTENTS OF  
SUBOCCIPITAL TRIANGLE

1. rectus capitis posterior minor.
2. posterior atlanto-occipital membrane (part of the floor).
3. posterior tubercle of atlas vertebra.
4. rectus capitis posterior major (upper and medial boundary).
5. spine of 2nd cervical vertebra.
6. greater occipital nerve hooking round the inferior oblique muscle.
7. superior oblique (upper and lateral boundary).
8. dorsal ramus of 1st cervical nerve (content).
9. 3rd part of vertebral artery (content).
10. transverse process of atlas vertebra.
11. inferior oblique (lower and lateral boundary).
12. posterior arch of atlas vertebra (part of the floor).



\* The contents of the triangle are the 3rd part of vertebral artery and dorsal ramus of the 1st cervical nerve which is a motor nerve.

Fig.(341): ROOF OF SUBOCCIPITAL TRIANGLE

It is formed by the semispinalis capitis and longissimus capitis.

1. greater occipital nerve (it pierces the semispinalis capitis near its insertion).
2. semispinalis capitis (forms most of the roof).
3. occipital artery as it reaches the occipital region lateral to the greater occipital nerve.
4. longissimus capitis (forms the lateral part of the roof).

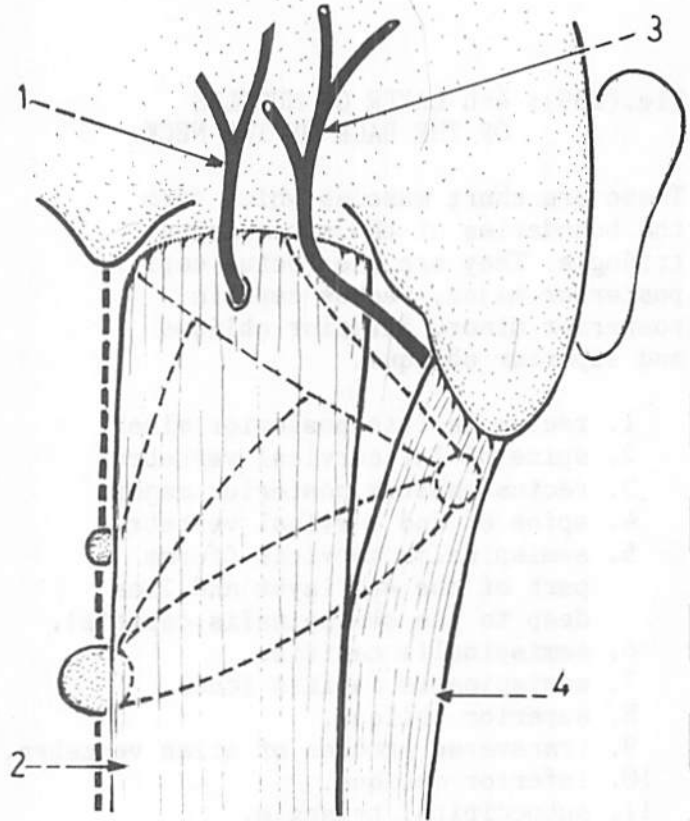
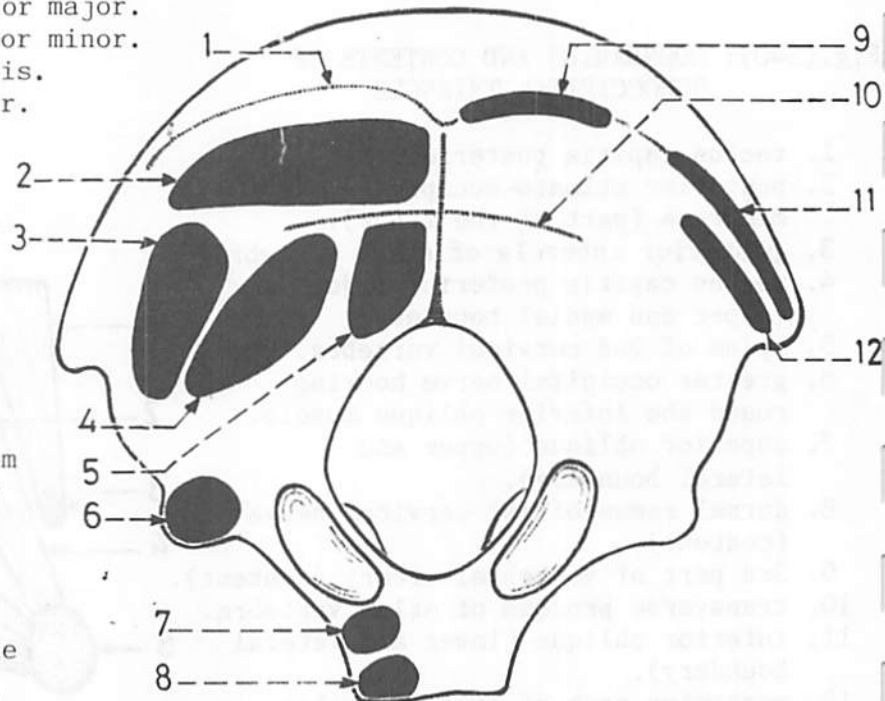


Fig.(342): ATTACHMENTS OF MUSCLES TO THE OCCIPITAL BONE

1. superior nuchal line.
2. semispinalis capitis.
3. superior oblique.
4. rectus capitis posterior major.
5. rectus capitis posterior minor.
6. rectus capitis lateralis.
7. rectus capitis anterior.
8. longus capitis.
9. trapezius.
10. inferior nuchal line.
11. sternomastoid.
12. splenius capitis.



\* The muscles of the back of the neck can also be identified from the direction of their fibres as follows:  
 the fibres of the trapezius (1st layer) run downwards and laterally, those of the splenius capitis (2nd layer) run upwards and laterally while those of the semispinalis (3rd layer) run directly upwards parallel to the midline.



# ANTERIOR TRIANGLE OF THE NECK

Fig.(343): SUBDIVISIONS OF THE ANTERIOR TRIANGLE

The anterior triangle of the neck is bounded above by the lower border of the mandible, behind by the anterior border of the sternomastoid and in front by the mid-line of the neck. It is divided into 4 smaller triangles termed submental, digastric, carotid and muscular by the 2 bellies of the digastric and superior belly of omohyoid.

1. submental triangle.
2. digastric triangle.
3. carotid triangle.
4. muscular triangle.

\* The sternomastoid divides the side of the neck into 2 triangles: anterior triangle in front and posterior triangle behind.

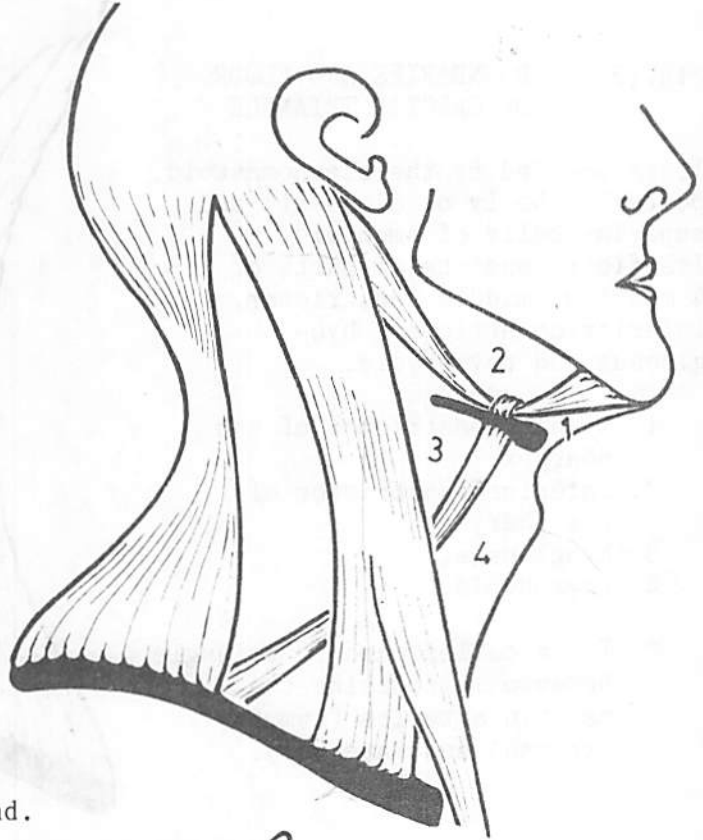


Fig.(344): BOUNDARIES AND FLOOR OF DIGASTRIC TRIANGLE

It is bounded by the 2 bellies of the digastric and the lower border of the mandible. Its floor consists of the mylohyoid and hyoglossus muscles.

1. posterior belly of digastric.
2. hyoglossus.
3. anterior belly of digastric.
4. mylohyoid.

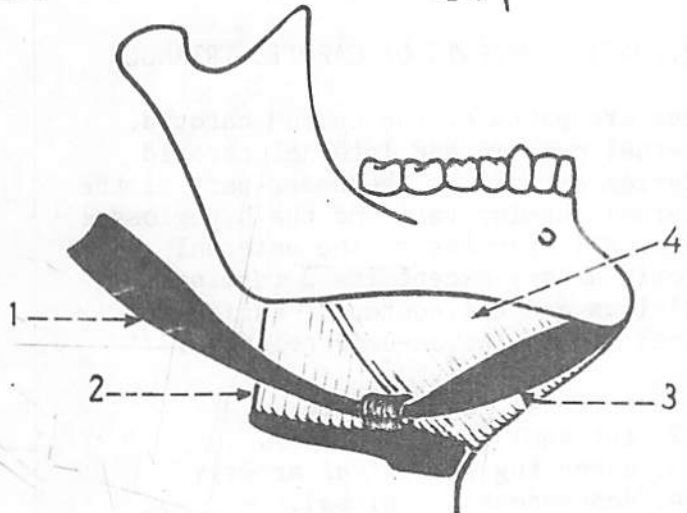


Fig.(345): CONTENTS OF DIGASTRIC TRIANGLE

These are the submandibular salivary gland and related structures which are the facial artery, facial vein and submandibular lymph nodes.

1. facial artery.
2. facial vein.
3. submandibular lymph nodes.
4. submandibular salivary gland.

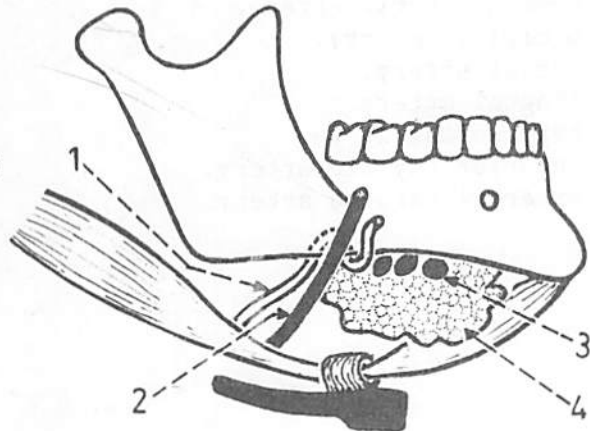


Fig.(346): BOUNDARIES AND FLOOR OF CAROTID TRIANGLE

It is bounded by the sternomastoid, posterior belly of digastric and superior belly of omohyoid. Its floor consists of parts of 4 muscles: middle constrictor, inferior constrictor, hyoglossus and thyrohyoid.

1. middle constrictor of the pharynx.
2. inferior constrictor of the pharynx.
3. hyoglossus.
4. thyrohyoid.

\* It is called carotid triangle because it contains the 3 carotid arteries (common, external and internal).

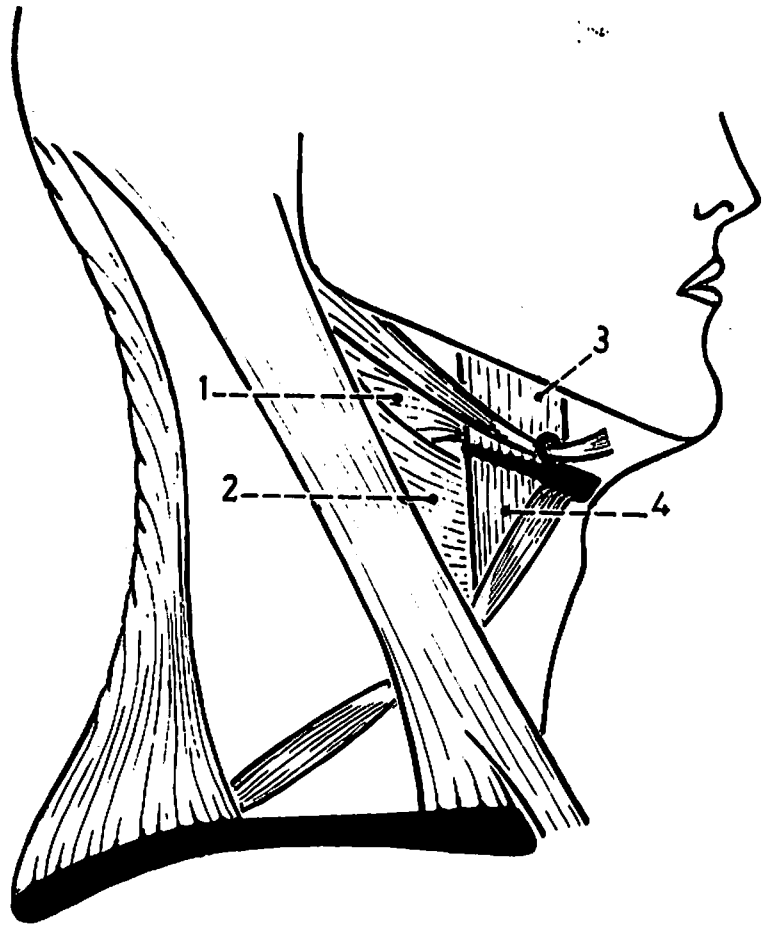


Fig.(347): CONTENTS OF CAROTID TRIANGLE

These are parts of the common carotid, external carotid and internal carotid arteries as well as the upper part of the internal jugular vein and the hypoglossal nerve. All branches of the external carotid artery except its 2 terminal divisions and the posterior auricular branch lie in the carotid triangle.

1. internal jugular vein.
2. internal carotid artery.
3. ascending pharyngeal artery.
4. descendens hypoglossi.
5. common carotid artery.
6. occipital artery.
7. facial artery.
8. lingual artery.
9. hypoglossal nerve.
10. superior thyroid artery.
11. external carotid artery.

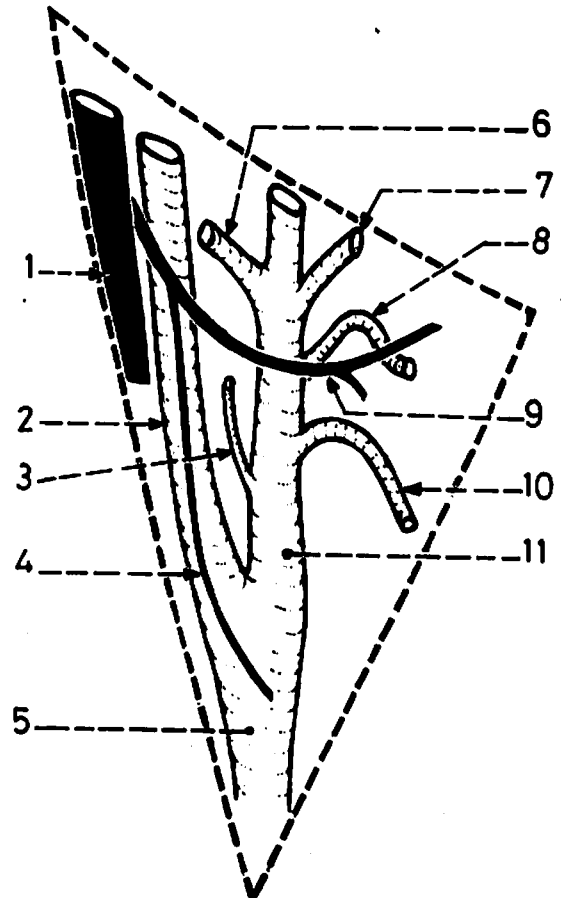


Fig.(348): SUBMENTAL TRIANGLE

It is bounded by the 2 anterior bellies of digastric and the body of hyoid bone. Its floor is formed by parts of the 2 mylohyoid muscles. Its contents are 1-2 submental lymph nodes and the beginning of the 2 anterior jugular veins.

1. submental lymph node.
2. anterior belly of digastric.
3. mylohyoid muscle.
4. beginning of anterior jugular vein.

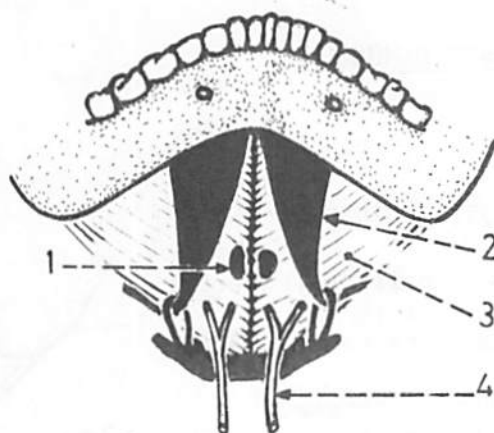


Fig.(349): MUSCULAR TRIANGLE

It is bounded by the sternomastoid, superior belly of omohyoid and mid-line of the neck. It contains the infrahyoid muscles.

1. hyoid bone.
2. superior belly of omohyoid.
3. line representing the sternomastoid muscle.
4. sternohyoid muscle.
5. sternothyroid muscle.

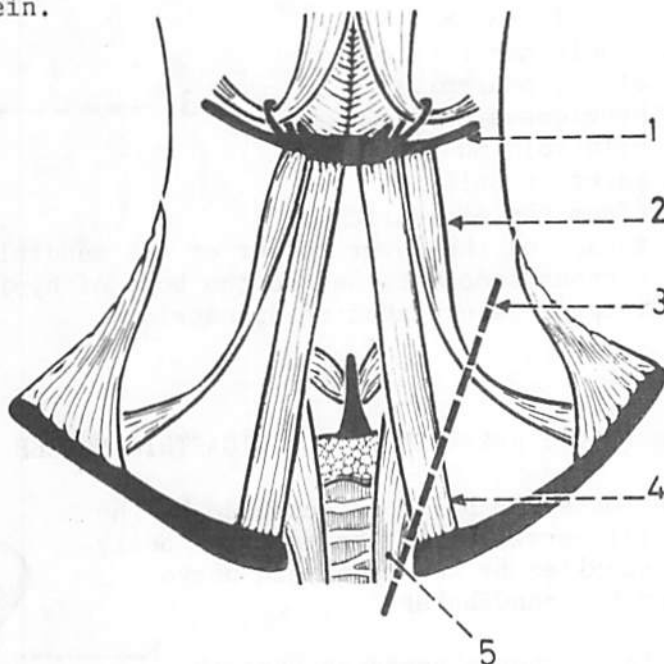
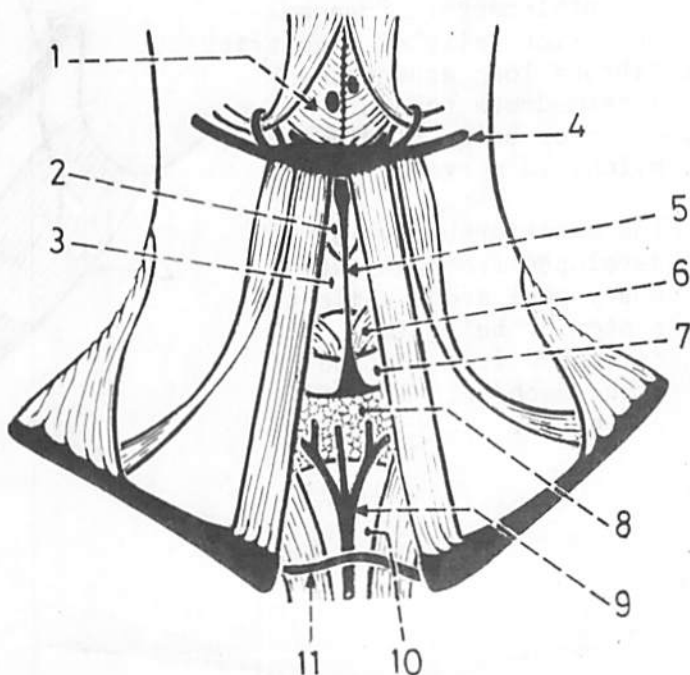


Fig.(350): STRUCTURES IN THE MIDLINE OF THE FRONT OF THE NECK

1. mylohyoid muscle.
2. thyrohyoid membrane.
3. thyroid cartilage.
4. hyoid bone.
5. levator glandulae thyroidae.
6. cricothyroid muscle.
7. cricoid cartilage.
8. isthmus of thyroid gland.
9. inferior thyroid veins.
10. trachea.
11. jugular arch.



## SUBMANDIBULAR REGION

### SUPRAHYOID MUSCLES

Fig.(351): DIGASTRIC MUSCLE

It has 2 bellies (anterior and posterior) and an intermediate tendon.

1. mastoid process.
2. posterior belly (arises from the mastoid notch).
3. middle constrictor of the pharynx.
4. hyoglossus muscle.
5. mylohyoid muscle.
6. anterior belly (from the digastric fossa on the lower border of the mandible).
7. fibrous loop attached to the body of hyoid bone.
8. intermediate tendon of digastric.

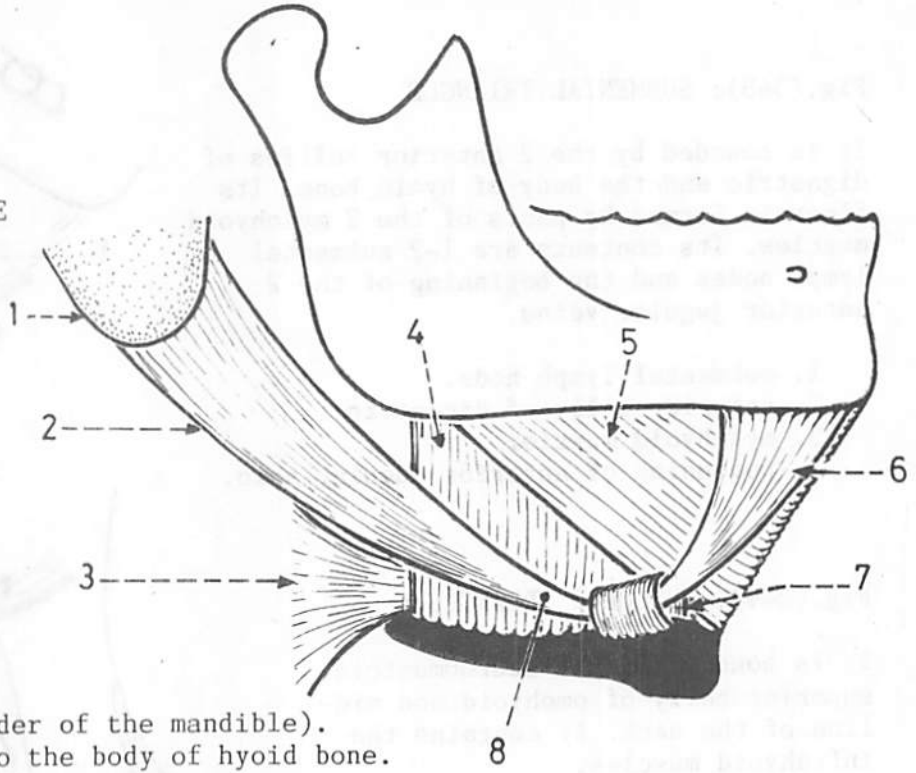


Fig.(352): NERVE SUPPLY OF DIGASTRIC MUSCLE

The posterior belly is supplied by the facial nerve, while the anterior belly is supplied by the mylohyoid nerve from the mandibular.

1. facial nerve emerging through the stylomastoid foramen.
2. posterior belly of digastric.
3. fibrous loop around the intermediate tendon.
4. anterior belly of digastric.
5. mylohyoid nerve.

\* The anterior belly is developed from the 1st pharyngeal arch, while the posterior belly is developed from the 2nd arch. Each arch has its own nerve.

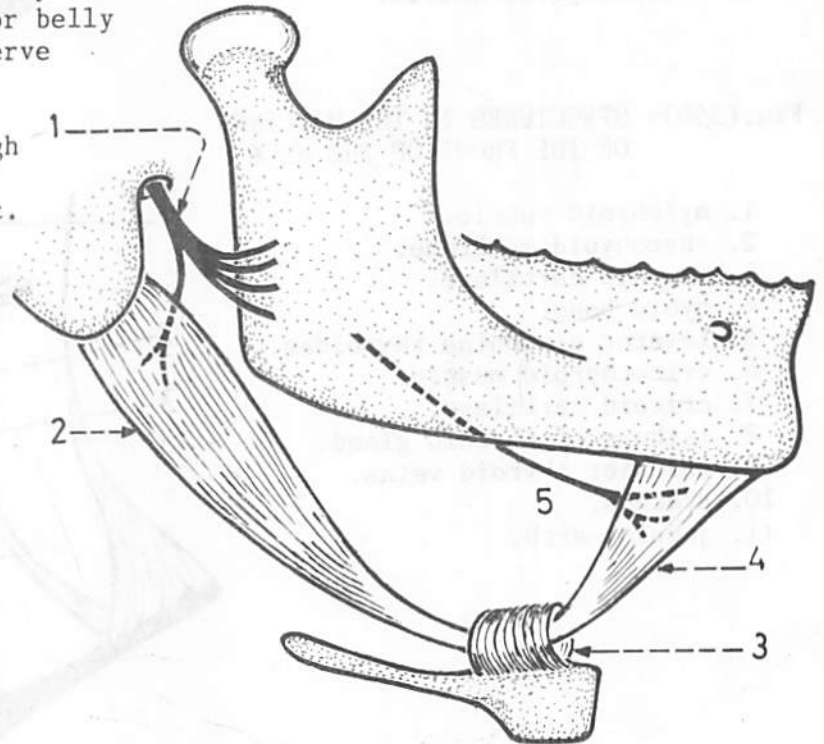


Fig.(353): SUPERFICIAL  
RELATIONS OF  
DIGASTRIC

These are the mastoid process and related muscles as well as the parotid and submandibular glands.

1. sternomastoid.
2. splenius capitis.
3. mastoid process.
4. longus capitis.
5. posterior belly of digastric.
6. retromandibular vein.
7. stylohyoid muscle.
8. submandibular gland (overlies the 2 bellies).
9. anterior belly of digastric.
10. parotid gland.

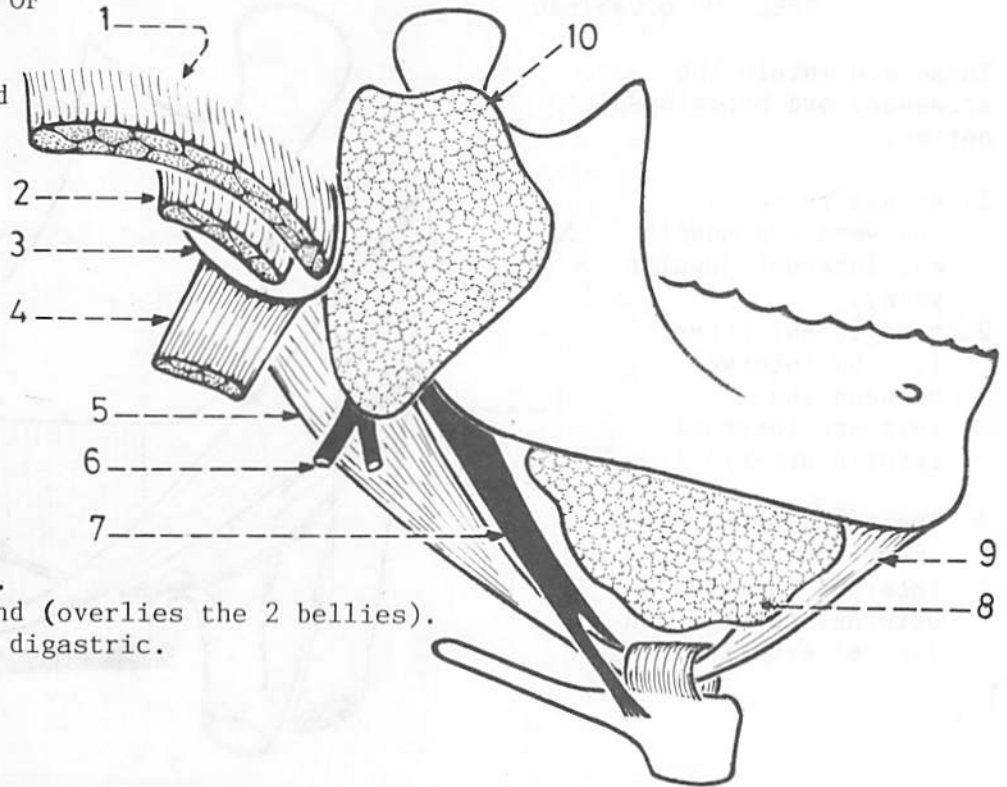


Fig.(354): VESSELS DEEP TO THE POSTERIOR  
BELLY OF DIGASTRIC

These are the internal jugular vein, internal carotid, external carotid, occipital and facial arteries.

1. posterior auricular artery (above the muscle).
2. occipital artery (partly behind and partly below the muscle).
3. internal jugular vein.
4. internal carotid artery.
5. external carotid artery.
6. facial artery.
7. lingual artery.

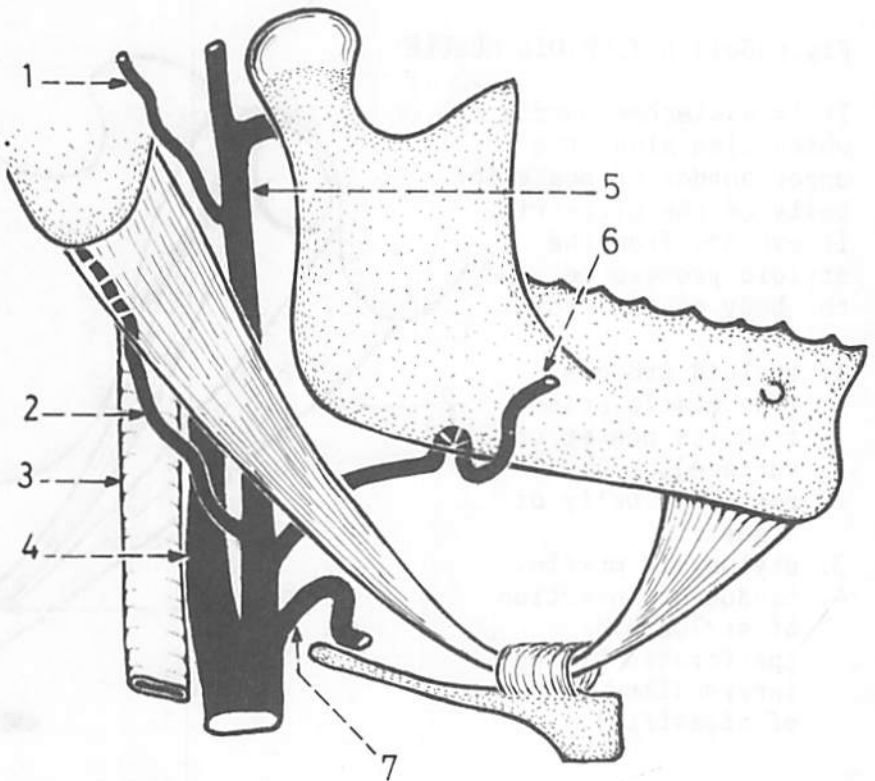




Fig.(355): NERVES DEEP TO THE POSTERIOR BELLY OF DIGASTRIC

These are mainly the accessory and hypoglossal nerves.

1. accessory nerve  
(between the muscle and internal jugular vein).
2. hypoglossal nerve  
(in the interval between the vein and internal carotid artery).

\* The hypoglossal nerve crosses over the internal carotid, external carotid and lingual arteries.

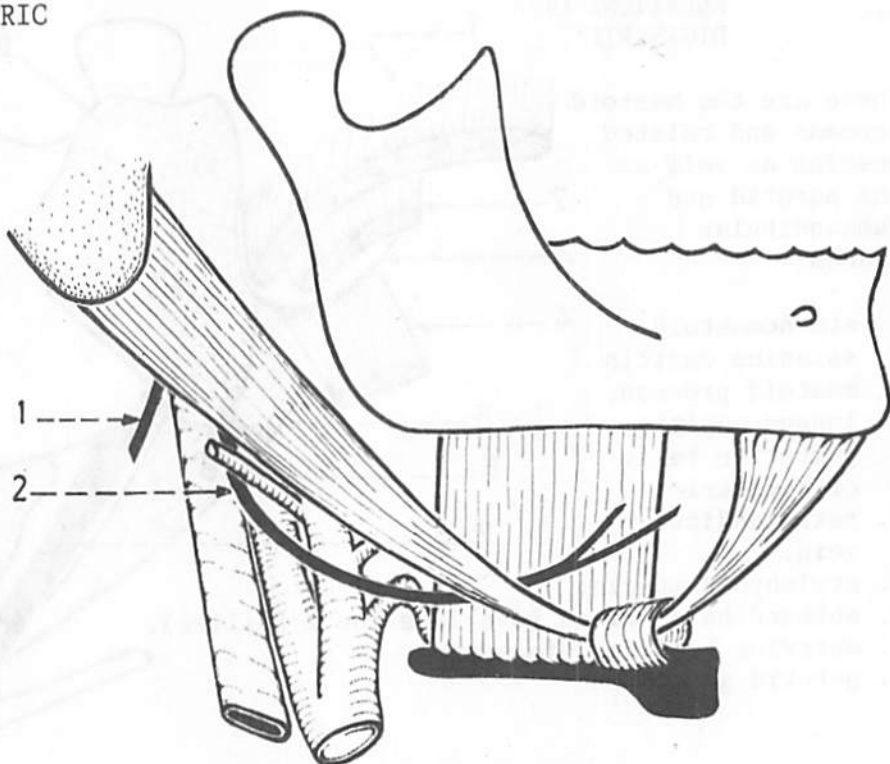
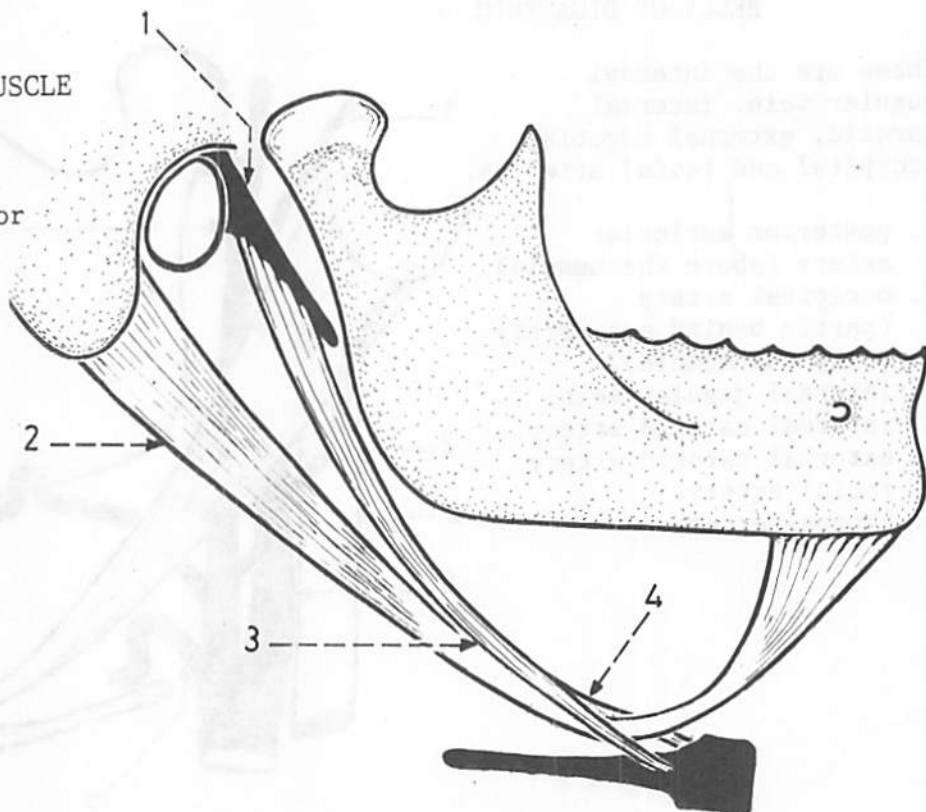


Fig.(356): STYLOHYOID MUSCLE

It is a slender muscle which lies along the upper border of posterior belly of the digastric. It extends from the styloid process to the body of the hyoid.

1. styloid process  
(the muscle arises from its posterior surface).
2. posterior belly of digastric.
3. stylohyoid muscle.
4. tendon of insertion of stylohyoid  
(perforated by the intermediate tendon of digastric).



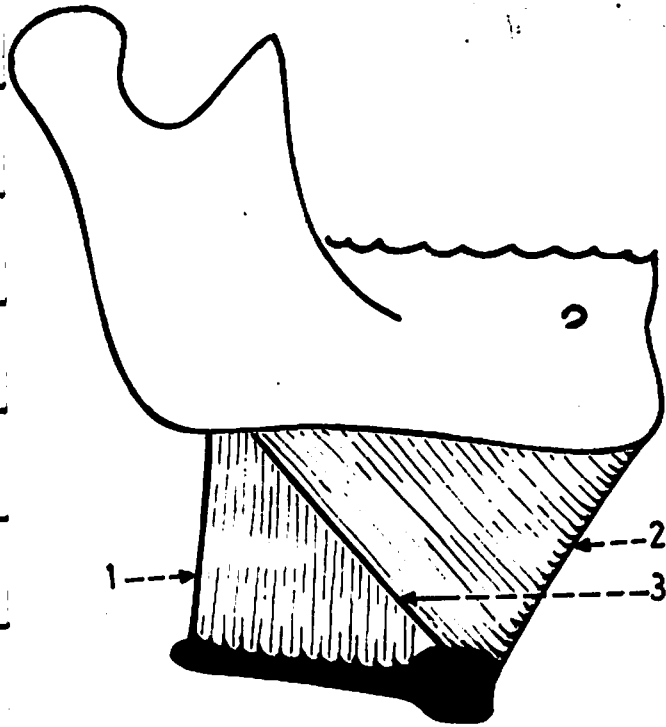


Fig.(357): MYLOHYOID MUSCLE

It is a flat triangular muscle which forms together with its fellow of the opposite side the floor of the mouth (diaphragma oris).

1. hyoglossus muscle (partly behind and partly deep to the mylohyoid).
2. mylohyoid muscle.
3. free posterior border of the mylohyoid muscle.

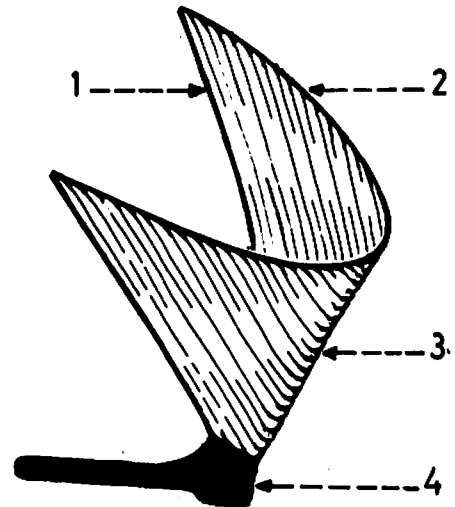


Fig.(358): SHAPE OF MYLOHYOID MUSCLE

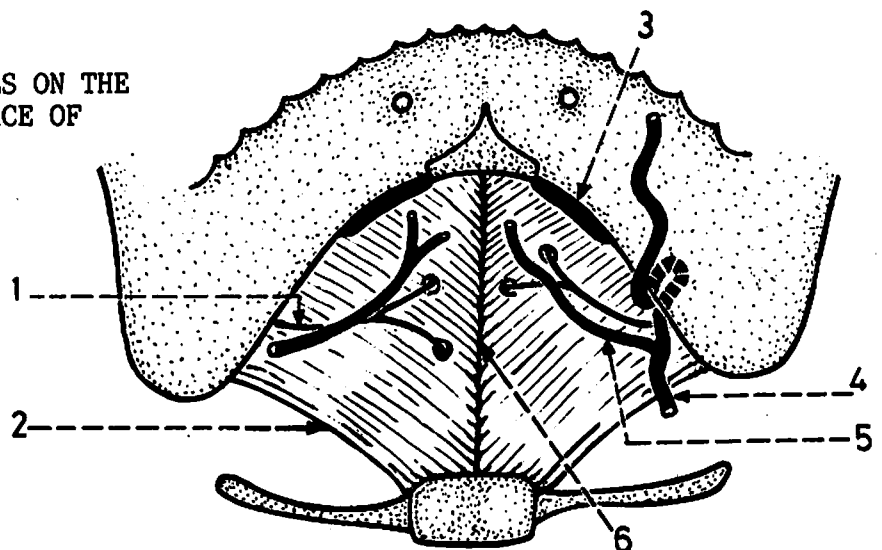
This figure shows the 2 mylohyoid muscles fused together at the median fibrous raphe. Each muscle has 3 borders (upper, posterior and anterior).

1. posterior border (free).
2. upper border (attached to the mylohyoid line).
3. anterior border (attached to the median fibrous raphe).
4. body of hyoid bone (gives insertion to the most posterior fibres of the muscle).

Fig.(359): NERVES AND VESSELS ON THE SUPERFICIAL SURFACE OF MYLOHYOID MUSCLE

These are the submental artery and mylohyoid nerve.

1. mylohyoid nerve.
2. mylohyoid muscle.
3. digastric fossa.
4. facial artery.
5. submental artery.
6. mylohyoid raphe (between the 2 muscles).



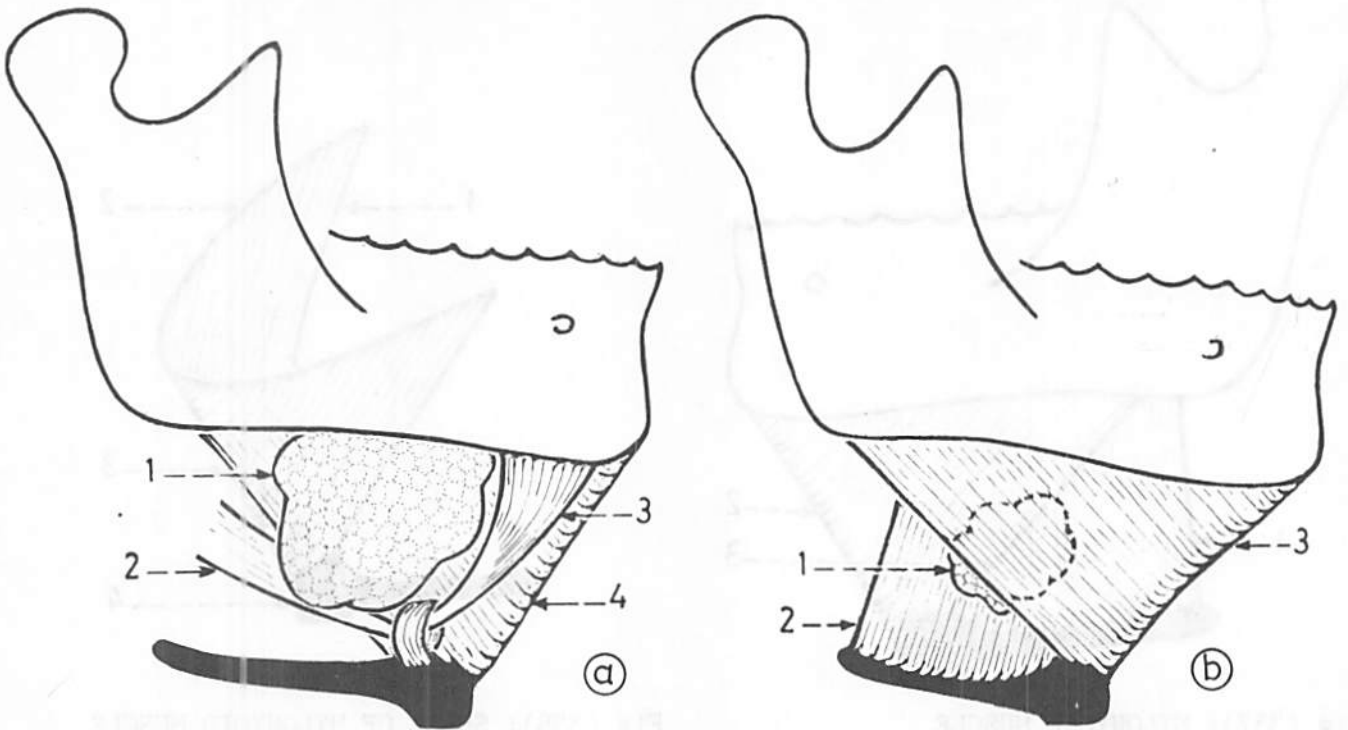


Fig.(360): RELATION OF SUBMANDIBULAR GLAND TO MYLOHYOID MUSCLE

The gland has a superficial part superficial to the muscle and a deep part deep to the muscle. The 2 parts are continuous together around the posterior free border of the muscle.

(a) Superficial part of the gland

1. superficial part of submandibular gland.
- 2 posterior belly of digastric.
3. anterior belly of digastric.
4. mylohyoid muscle.

(b) Deep part of the gland

1. deep part of submandibular gland (between the mylohyoid and hyoglossus).
2. hyoglossus muscle.
3. mylohyoid muscle.

Fig.(361): DEEP RELATIONS OF MYLOHYOID MUSCLE

1. lingual nerve.
2. submandibular ganglion.
3. hyoglossus muscle.
4. deep part of submandibular gland and its duct.
5. hypoglossal nerve.
6. genioglossus muscle.
7. geniohyoid muscle.
8. 3rd part of lingual artery.

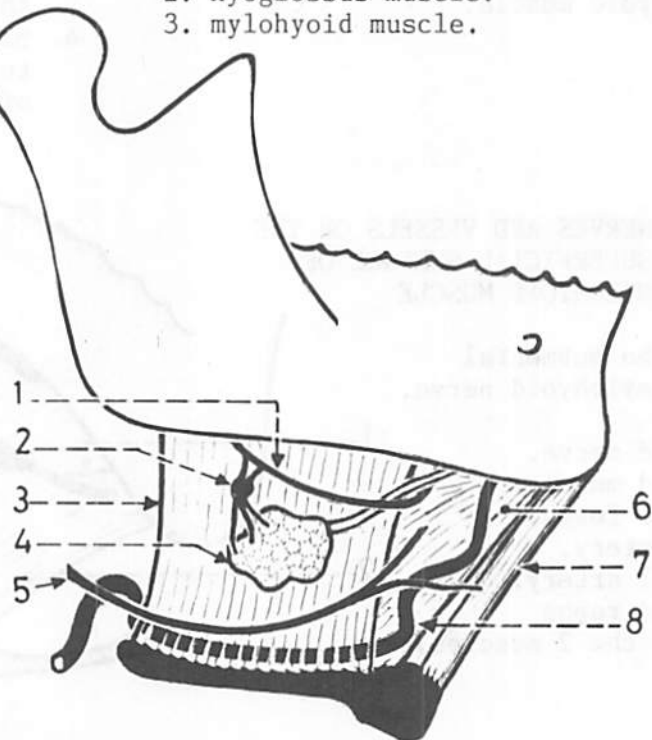




Fig.(362): DIAPHRAGMA ORIS  
(coronal section)

It is formed by the 2 mylohyoid muscles.

1. tongue.
2. mucous membrane of the floor of the mouth.
3. diaphragma oris (floor of the mouth).
4. anterior belly of digastric.

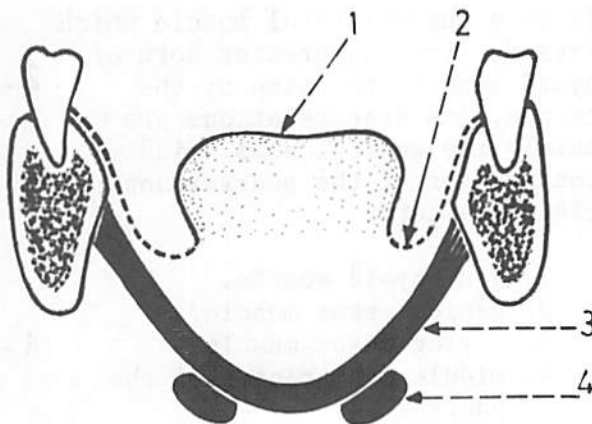


Fig.(363): STRUCTURES ABOVE THE  
DIAPHRAGMA ORIS

These are the genioglossus, geniohyoid and hyoglossus muscles of both sides.

1. diaphragma oris.
2. deep part of submandibular gland.
3. hyoglossus muscle.
4. tongue.
5. genioglossus muscle (close to the midline).
6. geniohyoid muscle (close to the midline).

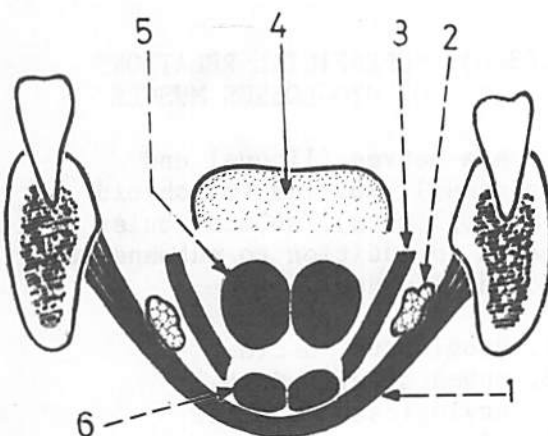


Fig.(364): GENIOGLOSSUS AND  
GENIOHYOID MUSCLES

The genioglossus is fan-shaped extending from the superior genial tubercle to the front of the tongue from the root to the apex.

The geniohyoid lies below the genioglossus and extends from the inferior genial tubercle to the body of hyoid bone.

1. genioglossus muscle (fan-shaped).
2. superior genial tubercle.
3. inferior genial tubercle.
4. mylohyoid muscle.
5. geniohyoid muscle.

\* The genioglossus and geniohyoid muscles lie close to the midline between the floor of the mouth and mylohyoid muscle.

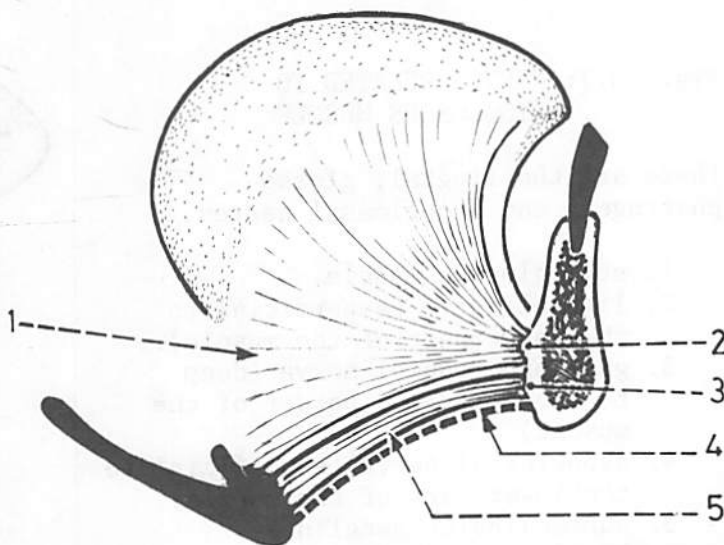


Fig.(365): HYOGLOSSUS MUSCLE AND ITS DEEP RELATIONS

It is a quadrilateral muscle which extends from the greater horn of hyoid bone to the side of the tongue. Its deep relations are mainly the genioglossus, middle constrictor of the pharynx and lingual artery.

1. geniohyoid muscle.
2. genioglossus muscle.
3. styloglossus muscle.
4. middle constrictor of the pharynx.
5. lingual artery.
6. hyoglossus muscle.

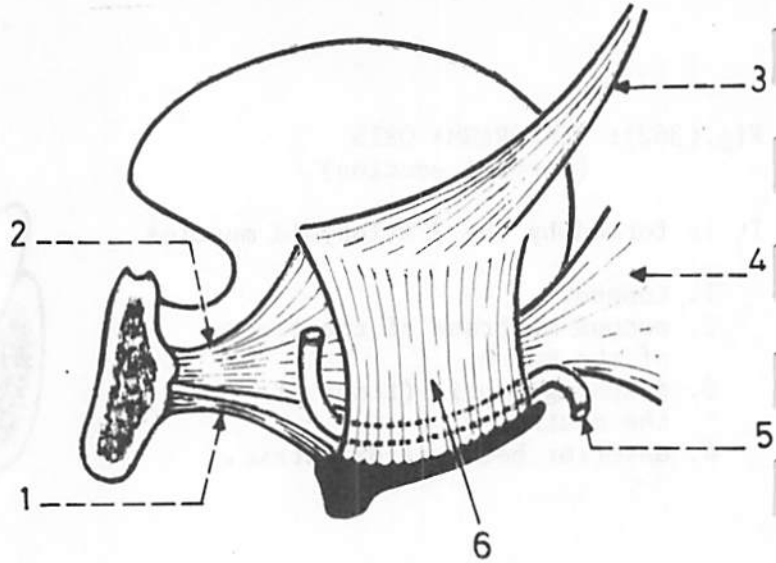


Fig.(366): SUPERFICIAL RELATIONS OF HYOGLOSSUS MUSCLE

These are nerves (lingual and hypoglossal), muscles (mylohyoid and styloglossus), submandibular ganglion in addition to submandibular gland and its duct.

1. hyoglossus muscle.
2. submandibular duct.
3. styloglossus muscle.
4. lingual nerve.
5. submandibular ganglion.
6. deep part of submandibular gland.
7. hypoglossal nerve.

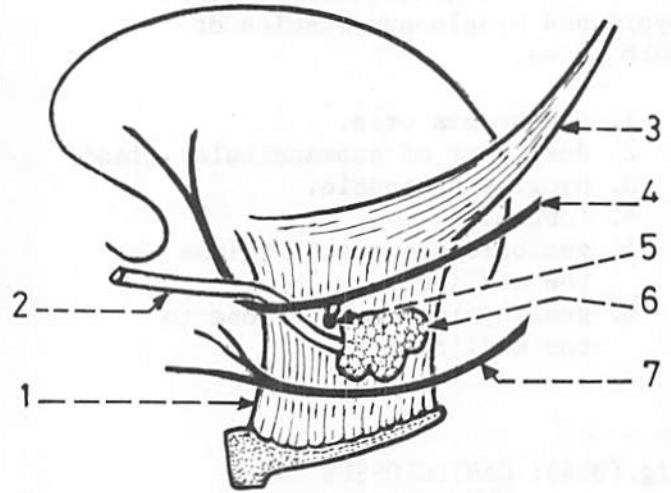
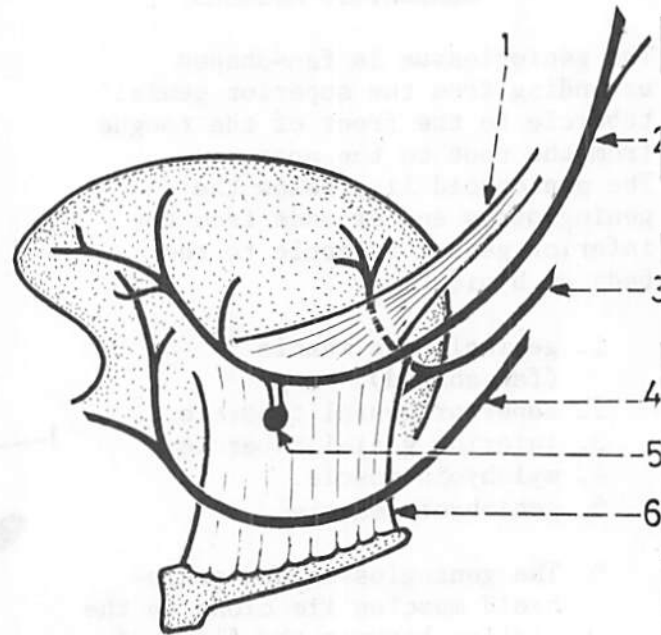


Fig.(367): NERVES RELATED TO HYOGLOSSUS MUSCLE

These are the lingual, glossopharyngeal and hypoglossal nerves.

1. styloglossus muscle.
2. lingual nerve (superficial to the upper part of the muscle).
3. glossopharyngeal nerve (deep to the posterior border of the muscle)
4. hypoglossal nerve (superficial to the lower part of the muscle).
5. submandibular ganglion.
6. hyoglossus muscle.



# SUBMANDIBULAR AND SUBLINGUAL GLANDS

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Fig.(368): THE 3 SALIVARY GLANDS

These are the parotid, submandibular and sublingual glands. The parotid opens into the vestibule of the mouth while the other 2 glands open into the cavity of the mouth proper below the tongue.

1. parotid gland (related to the ramus of the mandible).
2. submandibular gland (lies in the submandibular region).
3. sublingual gland (lies in the floor of the mouth).

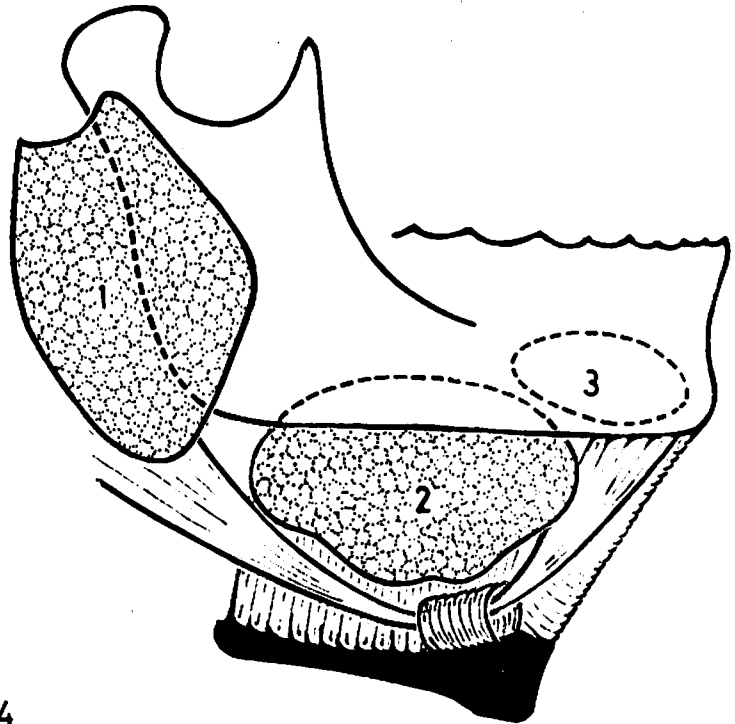
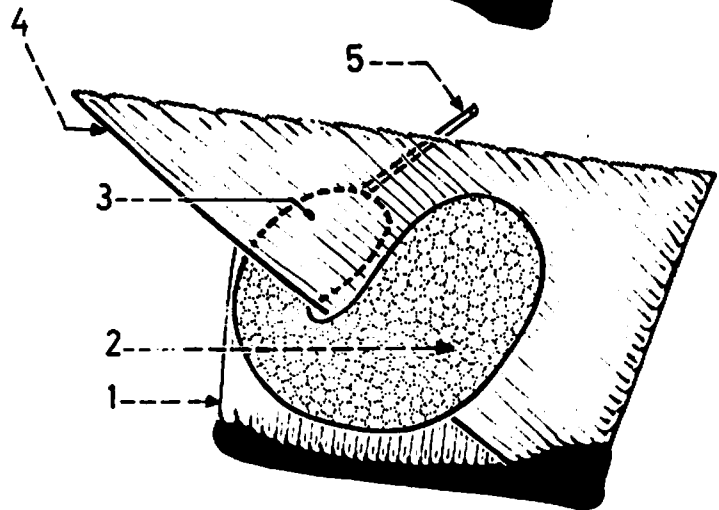


Fig.(369): PARTS OF SUBMANDIBULAR GLAND

The gland consists of 2 parts: a large superficial part (superficial to the mylohyoid) and a smaller deep part (deep to the mylohyoid).

1. hyoglossus muscle.
2. superficial part of submandibular gland.
3. deep part of submandibular gland.
4. free posterior border of mylohyoid muscle.
5. submandibular duct.



- \* The 2 parts of the gland are continuous together around the posterior border of mylohyoid muscle.

Fig.(370): SURFACES OF SUPERFICIAL PART OF SUBMANDIBULAR GLAND

These are inferior, lateral and medial surfaces.

1. mylohyoid line.
2. deep part of the gland and its duct.
3. mylohyoid muscle.
4. deep fascia around the gland.
5. lateral surface (related to the mandible).
6. inferior surface (superficial).
7. medial surface (related to the mylohyoid muscle).

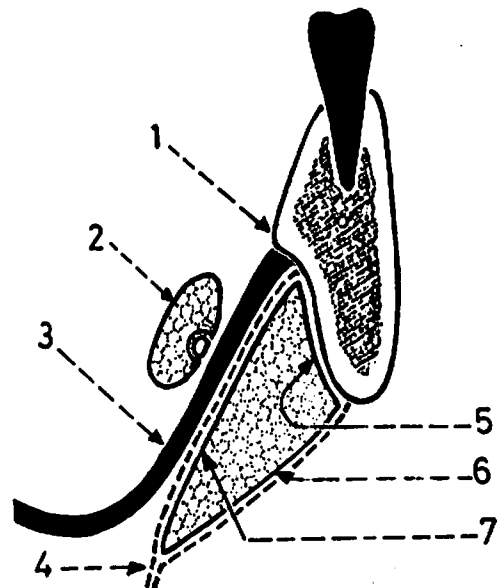


Fig.(371): SUPERFICIAL RELATIONS OF SUPERFICIAL PART OF SUBMANDIBULAR GLAND

The inferior surface of the superficial part of the gland is related to skin, fascia, cervical and mandibular branches of facial nerve, facial vein and submandibular lymph nodes.

1. facial vein.
2. mandibular branch of facial nerve.
3. cervical branch of facial nerve (to the platysma).
4. submandibular lymph nodes.
5. inferior surface of the gland.

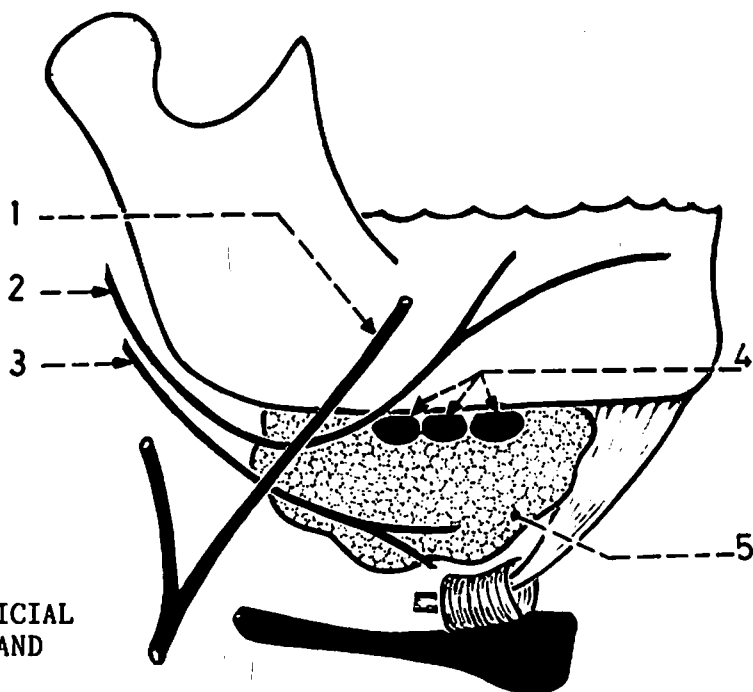


Fig.(372): DEEP RELATIONS OF SUPERFICIAL PART OF SUBMANDIBULAR GLAND

The medial surface of the superficial part of the gland is related to the mylohyoid, hyoglossus, stylohyoid and posterior belly of digastric. In addition, it is related mainly to the hypoglossal nerve, mylohyoid nerve and submental artery.

1. hyoglossus muscle.
2. stylohyoid muscle.
3. posterior belly of digastric muscle.
4. hypoglossal nerve.
5. mylohyoid nerve and submental artery.
6. mylohyoid muscle.

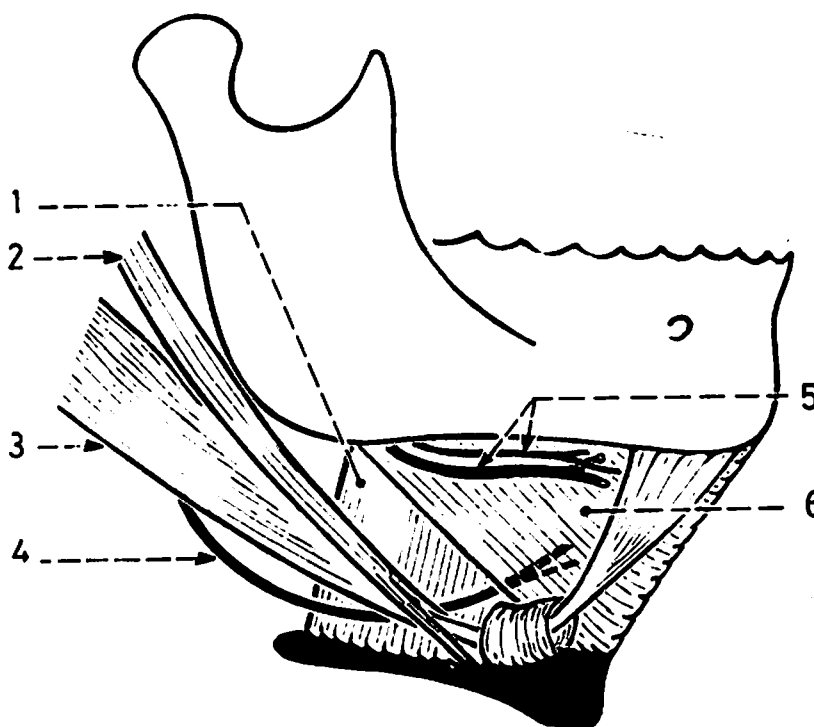


Fig.(373): RELATION OF FACIAL ARTERY TO SUBMANDIBULAR GLAND

The facial artery ascends in a groove on the posterior aspect of the gland as far as its upper end and then turns downwards on the lateral surface of the gland between it and the mandible to enter the face.

1. facial artery turning downwards between the lateral surface of the gland and body of the mandible.
2. facial artery on the posterior aspect of the gland.
3. facial artery in the face.

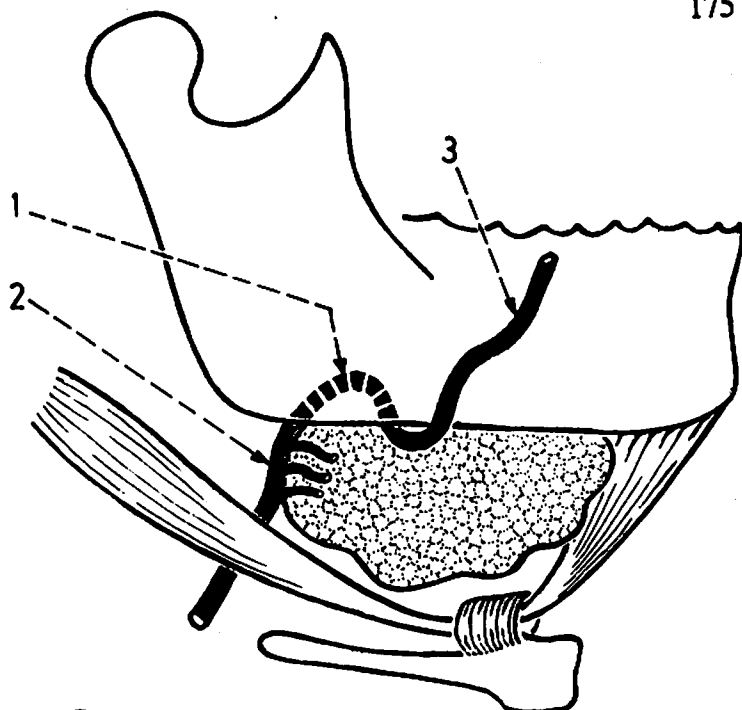


Fig.(374): FACIAL ARTERY IN RELATION TO THE LATERAL SURFACE OF THE GLAND

1. mylohyoid muscle.
2. body of mandible (cut).
3. facial artery.
4. lateral surface of the gland.
5. inferior surface of the gland.

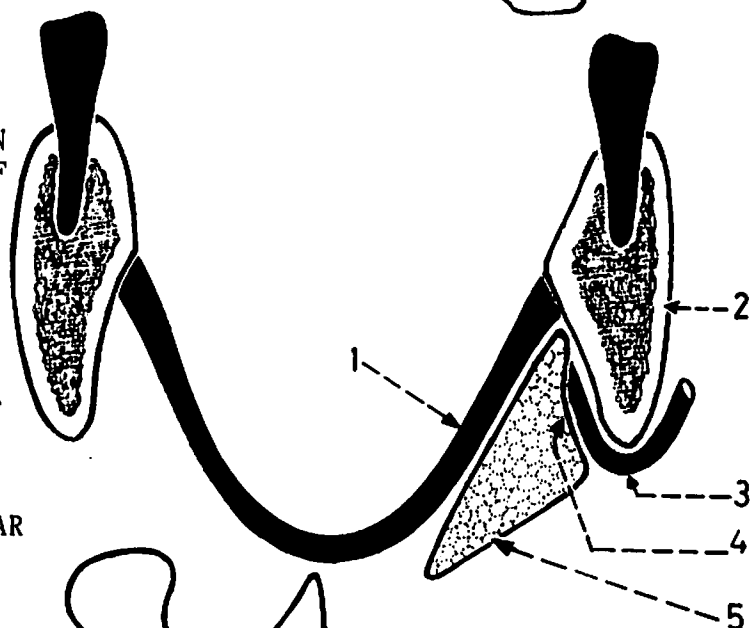


Fig.(375): DEEP PART OF SUBMANDIBULAR GLAND

It lies on the surface of the hyoglossus between it and the mylohyoid. It is related above to the lingual nerve and below to the hypoglossal nerve.

1. hyoglossus muscle.
2. lingual nerve.
3. submandibular ganglion.
4. deep part of submandibular gland.
5. hypoglossal nerve.
6. submandibular duct.
7. genioglossus muscle.
8. geniohyoid muscle.

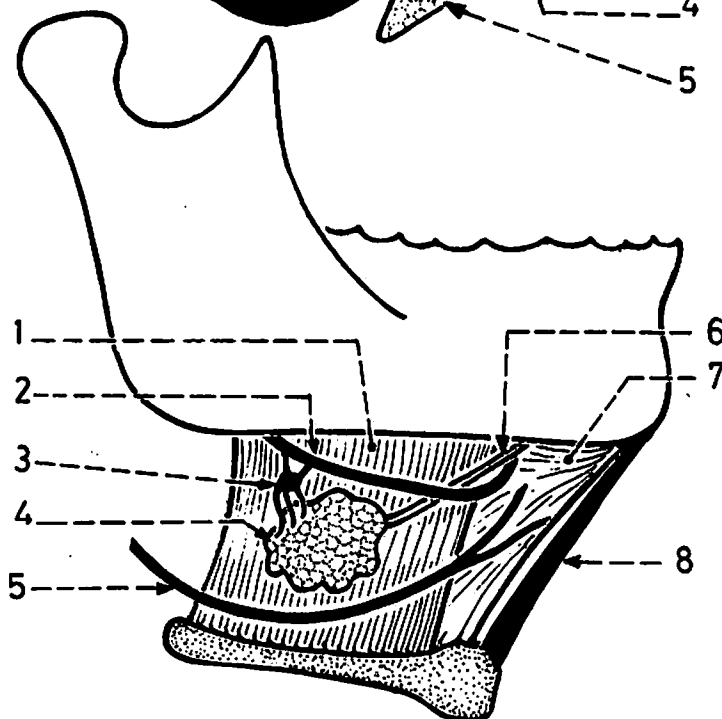
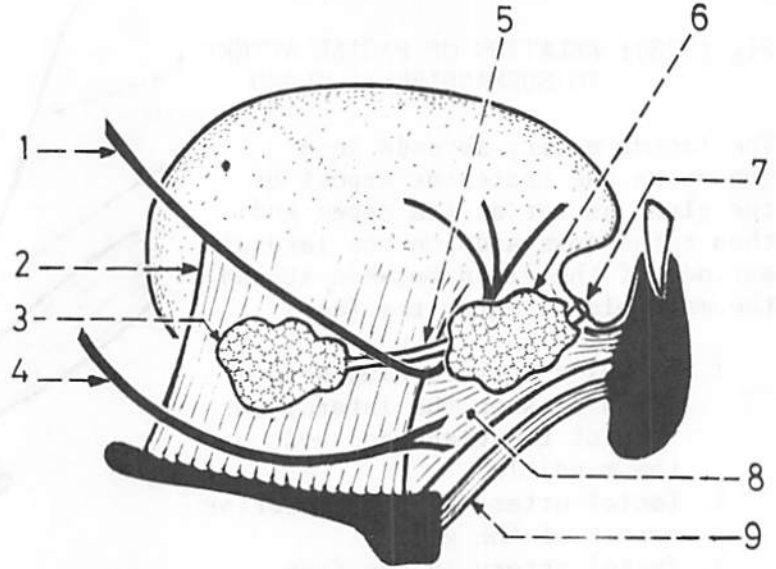


Fig.(376): SUBMANDIBULAR DUCT

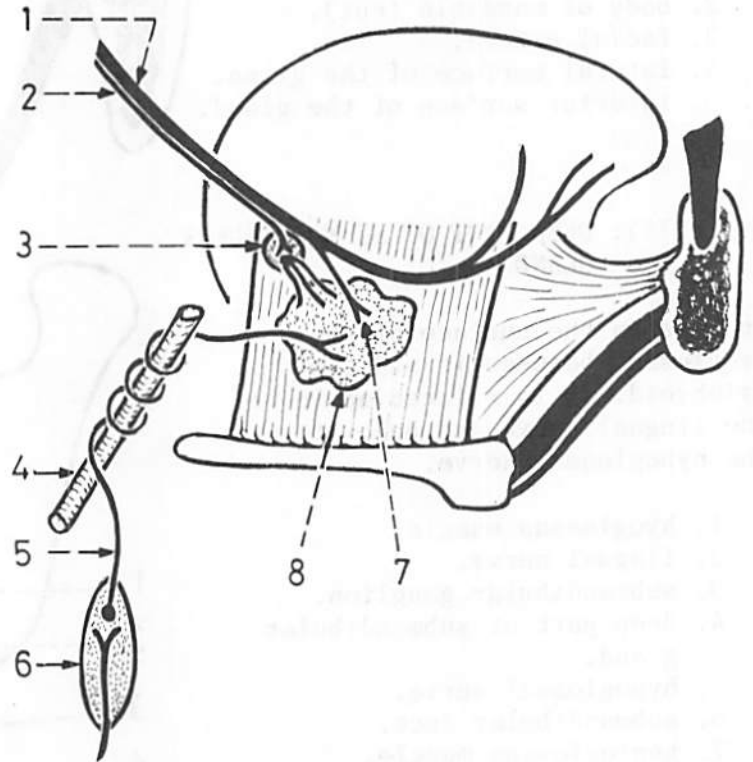
It is 5 cm long. It runs forwards at 1st between the hyoglossus and mylohyoid muscles and here it lies along the deep part of submandibular gland. It then lies deep to the sublingual gland between it and the genioglossus muscle. It opens on the floor of the mouth on the summit of the sublingual papilla.



1. lingual nerve (hooks around the submandibular duct).
2. hyoglossus muscle.
3. deep part of submandibular gland.
4. hypoglossal nerve.
5. submandibular duct.
6. sublingual gland.
7. opening of submandibular duct on the floor of the mouth.
8. genioglossus muscle.
9. geniohyoid muscle.

Fig.(377): NERVE SUPPLY OF SUBMANDIBULAR GLAND

The gland gets its sensory supply from the lingual nerve, parasympathetic supply from the chorda tympani and sympathetic supply from the plexus around the facial artery.



1. lingual nerve.
2. preganglionic fibres from the chorda tympani joining the lingual nerve.
3. submandibular ganglion (parasympathetic).
4. facial artery surrounded by sympathetic plexus.
5. postganglionic sympathetic fibres.
6. superior cervical sympathetic ganglion.
7. sensory fibres to the gland.
8. submandibular gland.

Fig.(378): POSITION OF SUBLINGUAL GLAND

The sublingual gland lies beneath the mucous membrane of the floor of the mouth in the sublingual fossa of the mandible. It lies above the anterior part of the mylohyoid line.

1. opening of submandibular duct.
2. sublingual gland.
3. anterior part of mylohyoid line.
4. lingual nerve on the medial surface of the gland.
5. submandibular duct on the medial surface of the gland.
6. sublingual fold (mucous membrane raised by the gland and receives the openings of its ducts)

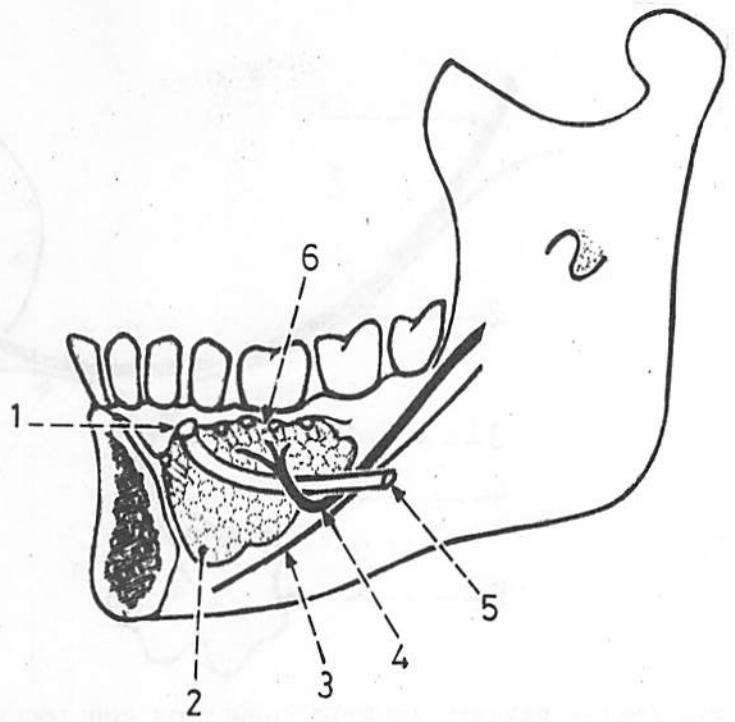


Fig.(379): SUBLINGUAL GLAND ON THE SIDE OF GENIOGLOSSUS

The gland lies on the side of the genioglossus from which it is separated by the submandibular duct and lingual nerve.

1. deep part of submandibular gland.
2. lingual nerve hooking round the submandibular duct.
3. submandibular duct.
4. sublingual fold.
5. sublingual gland.
6. genioglossus.

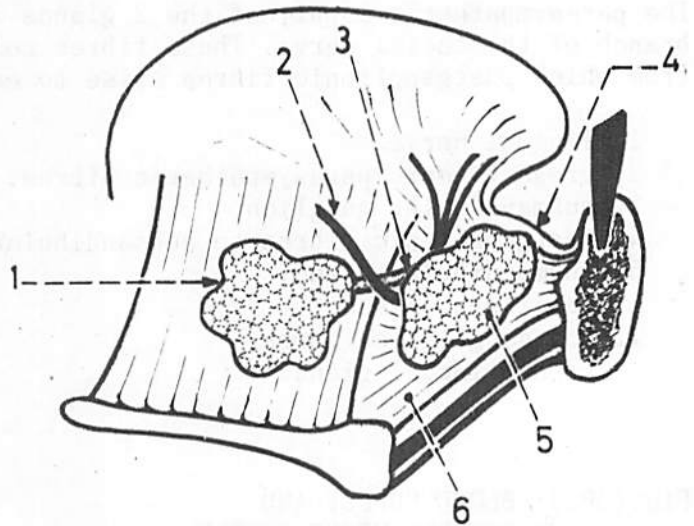
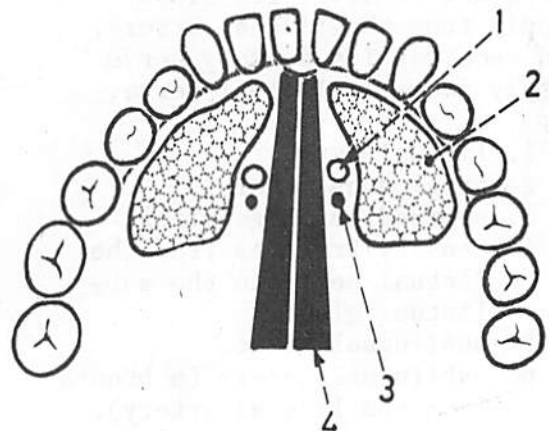


Fig.(380): MEDIAL RELATIONS OF SUBLINGUAL GLAND

These are the submandibular duct, lingual nerve and genioglossus muscle.

1. submandibular duct.
2. sublingual gland.
3. lingual nerve.
4. genioglossus muscle.





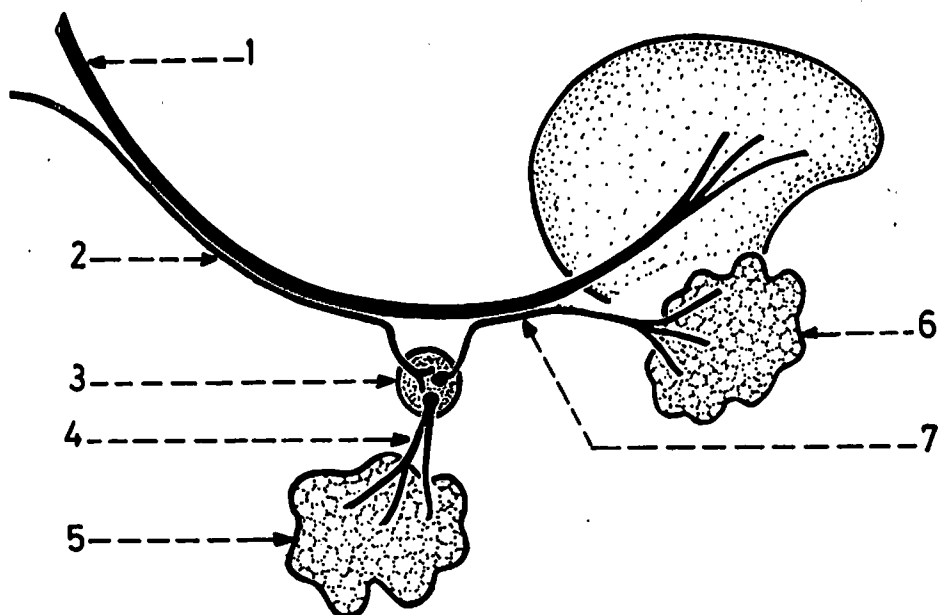


Fig.(381): PARASYMPATHETIC SUPPLY OF SUBLINGUAL AND SUBMANDIBULAR GLANDS

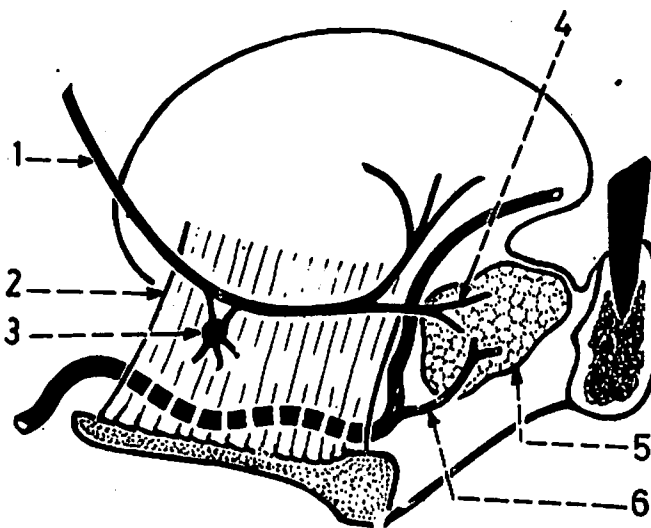
The parasympathetic supply of the 2 glands is derived from the chorda tympani branch of the facial nerve. These fibres relay in the submandibular ganglion from which postganglionic fibres arise to enter the substance of the 2 glands.

1. lingual nerve.
2. preganglionic parasympathetic fibres.
3. submandibular ganglion.
4. postganglionic fibres to submandibular gland.
5. submandibular gland.
6. sublingual gland.
7. postganglionic fibres to sublingual gland.

Fig.(382): BLOOD SUPPLY AND SENSORY NERVE SUPPLY OF SUBLINGUAL GLAND

The gland receives its blood supply from the lingual artery, and receives its sensory nerve supply from the lingual nerve.

1. lingual nerve.
2. hyoglossus muscle.
3. submandibular ganglion.
4. sensory branches from the lingual nerve to the sublingual gland.
5. sublingual gland.
6. sublingual artery (a branch from the lingual artery).





## STYLOID PROCESS

Fig.(383): MUSCLES ATTACHED TO STYLOID PROCESS

These are the stylohyoid, styloglossus and stylopharyngeus.

1. styloid process.
2. styloglossus muscle (from the styloid process to the side of the tongue).
3. stylopharyngeus muscle (from the styloid process to the posterior border of thyroid cartilage).
4. stylohyoid muscle (from the styloid process to body of hyoid bone).
5. hyoglossus muscle.

\* The 3 styloid muscles are related to hyoglossus muscle as follows: the stylohyoid lies superficial to its lower part, the styloglossus lies superficial to its upper part while the stylopharyngeus passes deep to its posterior border.

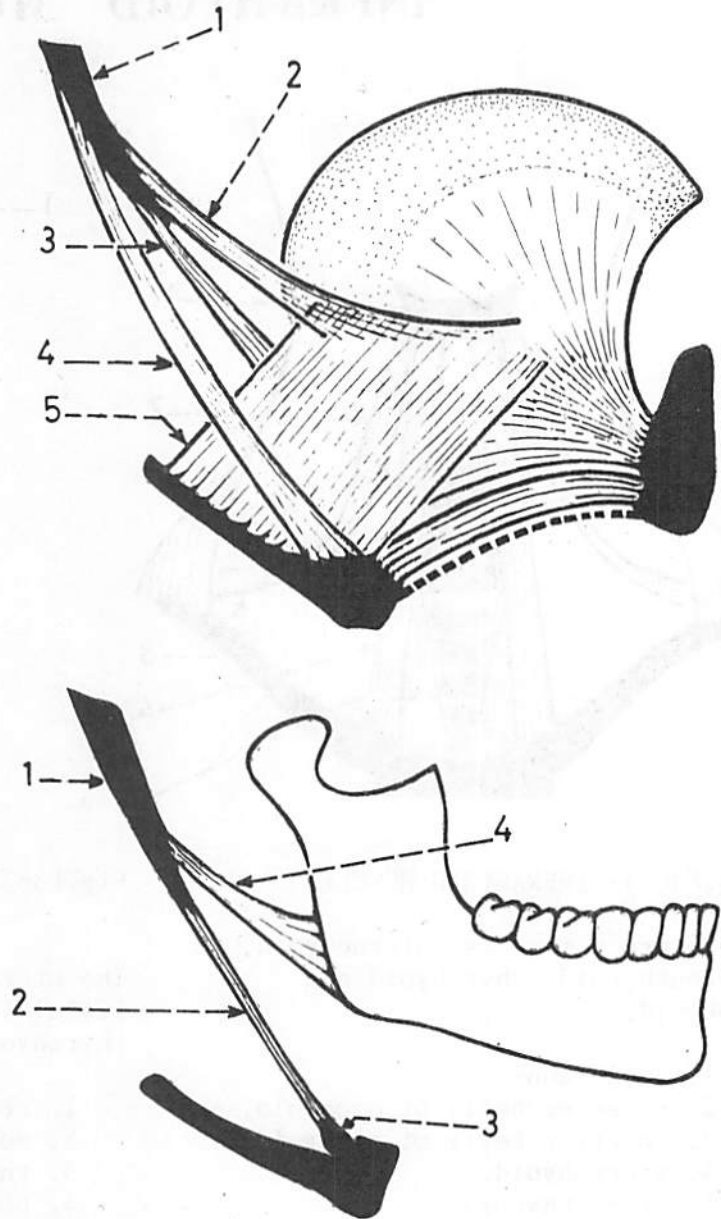


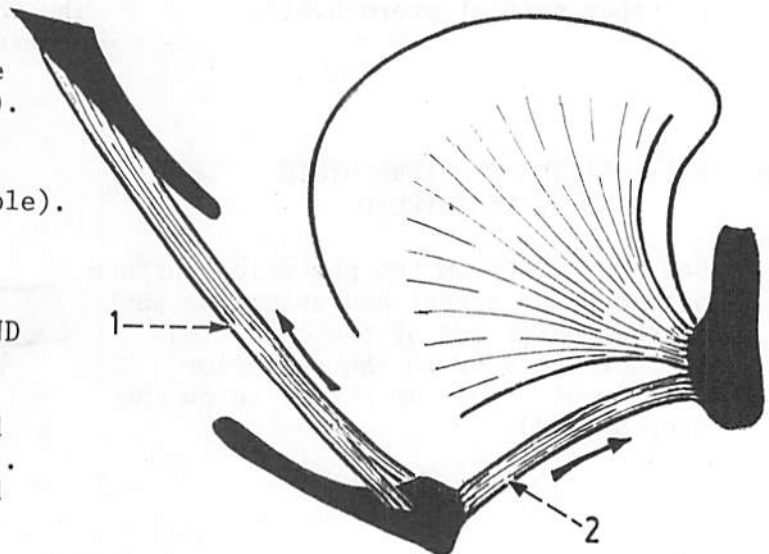
Fig.(384): LIGAMENTS ATTACHED TO STYLOID PROCESS

These are the stylohyoid and stylo-mandibular ligaments.

1. styloid process.
2. stylohyoid ligament (to the lesser cornu of hyoid bone).
3. lesser cornu of hyoid bone.
4. stylomandibular ligament. (to the angle of the mandible).

Fig(385): ACTION OF STYLOHYOID AND GENIOHYOID MUSCLES

1. stylohyoid (pulls the hyoid bone upwards and backwards).
2. geniohyoid (pulls the hyoid bone upwards and forwards).



## INFRAHYOID MUSCLES

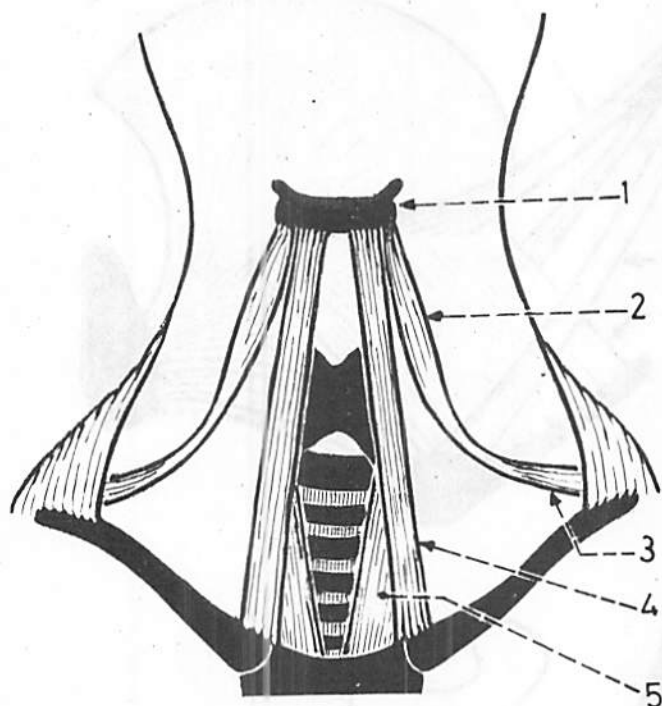


Fig.(386): INFRAHYOID MUSCLES

These are 4 muscles: sternohyoid, sternothyroid, thyrohyoid and omohyoid.

1. hyoid bone.
2. superior belly of omohyoid.
3. inferior belly of omohyoid.
4. sternohyoid.
5. sternothyroid.

\* The thyrohyoid is hidden by the upper part of sternohyoid.

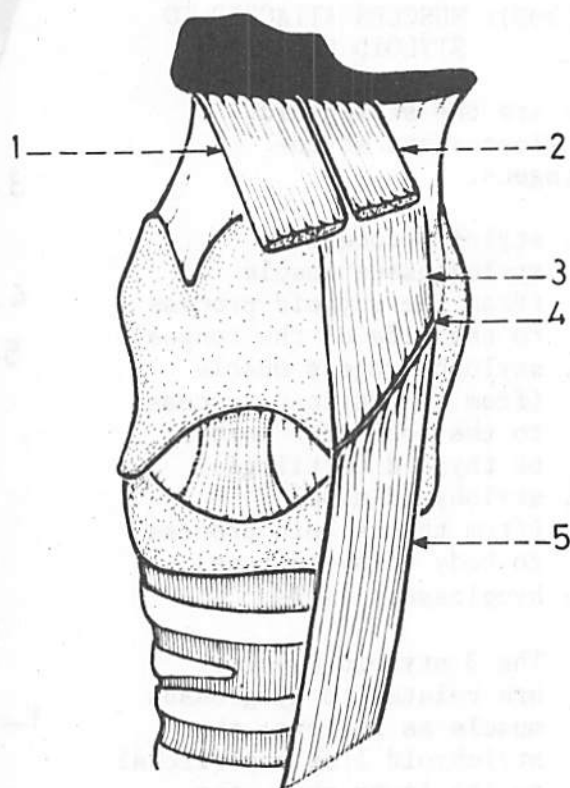


Fig.(387): INFRAHYOID MUSCLES ARRANGED IN 2 LAYERS

The sternohyoid and omohyoid form a superficial layer, while the sternothyroid and thyrohyoid form a deep layer.

1. sternohyoid (cut).
2. superior belly of omohyoid (cut).
3. thyrohyoid.
4. oblique ridge of thyroid cartilage.
5. sternothyroid.

\* The thyrohyoid appears to be the upward continuation of the sternothyroid.

Fig.(388): ORIGINS OF STERNOHYOID AND STERNOHYOID.

1. sternohyoid (from the posterior surface of manubrium sterni and adjoining part of the medial end of the clavicle).
2. sternothyroid (from the posterior surface of manubrium sterni below the sternohyoid).

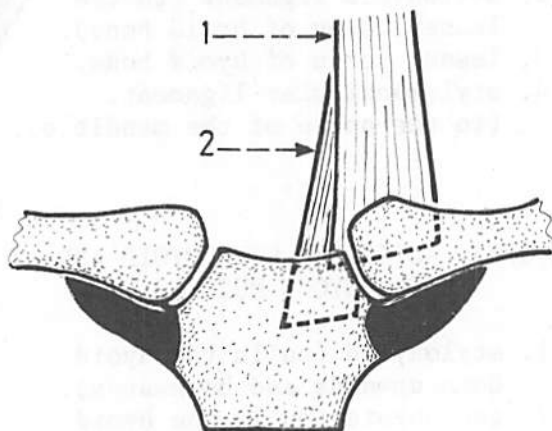


Fig.(389): THYROHYOID MUSCLE

It is a quadrilateral muscle extending from the oblique line of the thyroid cartilage to the lower border of the hyoid bone.

1. hypoglossal nerve.
2. branch from hypoglossal nerve to thyrohyoid muscle (derived from C.1).
3. thyrohyoid muscle.
4. oblique line of thyroid cartilage.
5. insertion of sternothyroid into the oblique line of thyroid cartilage.

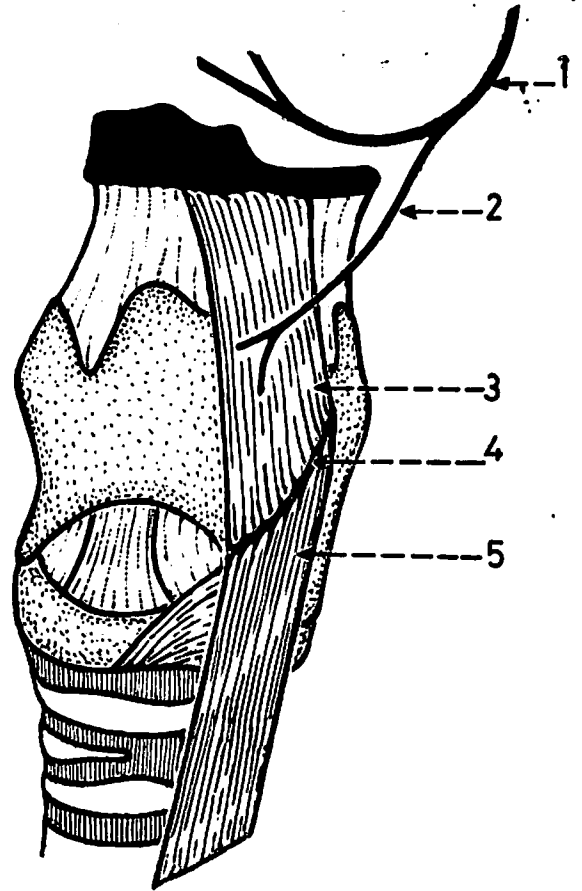
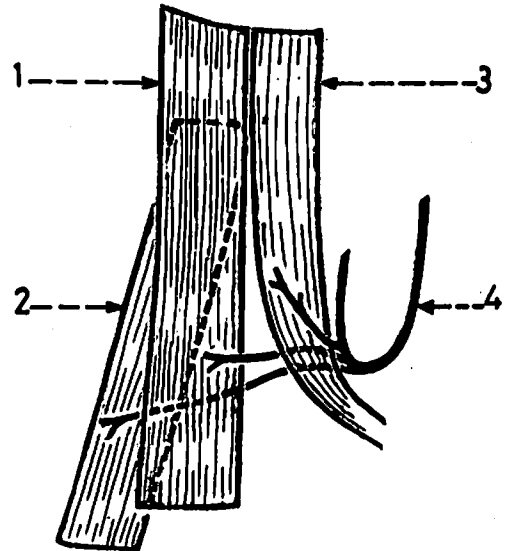


Fig.(390): NERVE SUPPLY OF INFRAHYOID MUSCLES FROM ANSA CERVICALIS

The sternohyoid, sternothyroid and omohyoid muscles are supplied by branches from the ansa cervicalis. This ansa is a loop of nerve fibres derived from C.1,2,3.

1. sternohyoid.
2. sternothyroid.
3. superior belly of omohyoid.
4. ansa cervicalis.

\* In contrast to the 4 infrahyoid muscles situated below the hyoid bone, there are 4 suprahyoid muscles situated above the hyoid bone; these are the digastric, mylohyoid, stylohyoid and geniohyoid. The infrahyoid muscles depress the hyoid bone, while the suprahyoid muscles elevate it.



## THYROID GLAND

Fig.(391): POSITION OF THYROID GLAND

It is an H-shaped gland situated in the front of the lower part of the neck. It has 2 lobes and an isthmus. Each lobe extends from the oblique line of thyroid cartilage above to the level of the 6th tracheal ring below. The isthmus lies in front of the 2nd, 3rd and 4th tracheal rings.

1. oblique line of thyroid cartilage.
2. cricoid cartilage.
3. isthmus of thyroid gland.
4. lobe of thyroid gland.
5. sternoclavicular joint (close to the base of the lobe of the gland).
6. trachea.

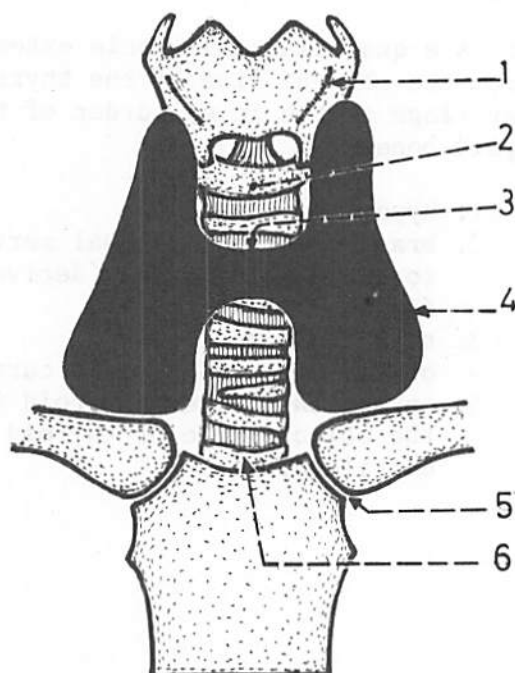


Fig.(392): PARTS OF THYROID GLAND

The gland consists of 2 lobes and an isthmus. Each lobe is conical in shape having an apex and a base. In addition there is a small pyramidal lobe situated at the upper border of the isthmus to the left of the median plane, and is connected to the hyoid bone by the levator glandulae thyroideae.

1. levator glandulae thyroideae (a fibromuscular band extending from the pyramidal lobe to the hyoid bone).
2. apex of the lobe.
3. pyramidal lobe.
4. lobe of the gland.
5. base of the lobe.
6. isthmus of the gland (connects the 2 lobes together).

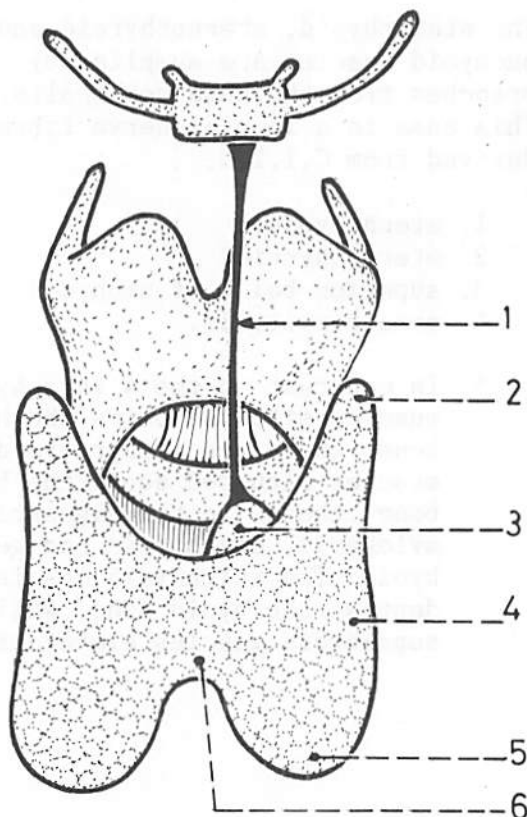
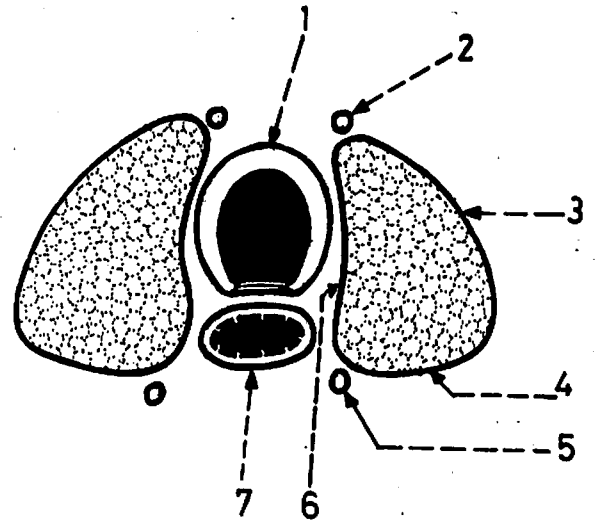


Fig.(393): SURFACES OF THYROID GLAND

Each lobe has 3 surfaces: lateral (superficial), medial and posterior.

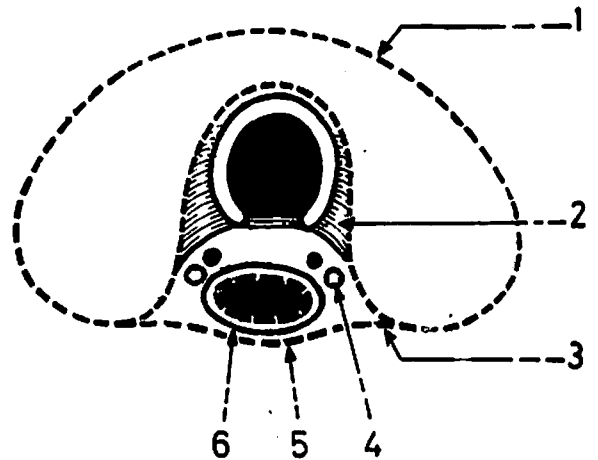
1. trachea.
2. anterior branch of superior thyroid artery.
3. lateral (superficial) surface.
4. posterior surface.
5. inferior thyroid artery.
6. medial surface.
7. oesophagus.



- \* The lobe of thyroid gland is triangular in cross section.

Fig.(394): PRETRACHEAL FASCIA

The thyroid gland is enclosed within the the pretracheal fascia. The fascia splits at the posterior border of the gland to enclose the oesophagus and recurrent laryngeal nerves as well. At the isthmus, the fascia on the medial surface of the gland is connected to the trachea.



1. pretracheal fascia enclosing the thyroid gland (T.S.).
2. connection between the fascia and trachea.
3. site of splitting of the fascia.
4. recurrent laryngeal nerve and inferior thyroid artery.
5. layer of the fascia behind the oesophagus.
6. oesophagus.

Fig.(395): POSTERIOR SURFACE OF THYROID GLAND

This surface is related to the 2 parathyroid glands and the anastomosis between the superior and inferior thyroid arteries.

1. posterior branch of superior thyroid artery.
2. superior parathyroid gland.
3. inferior thyroid artery.
4. inferior parathyroid gland.

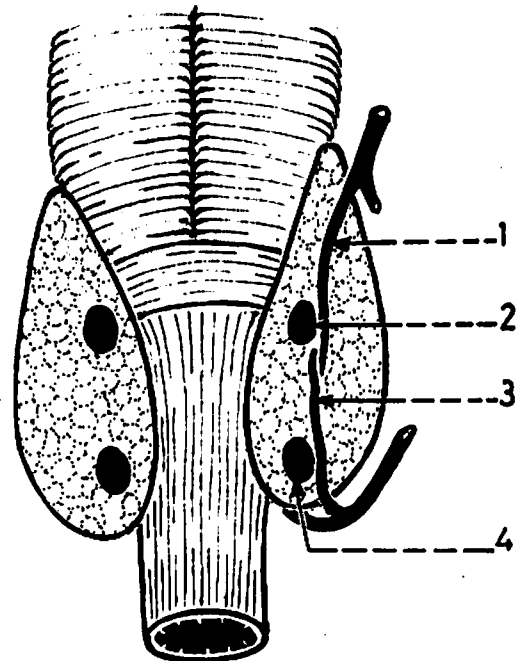


Fig.(396): RELATION OF THE POSTERIOR SURFACE OF THE GLAND TO THE COMMON CAROTID ARTERY

The posterior surface overlaps the common carotid artery as it lies in the carotid sheath. On the left side, the lower pole comes in close relation to the thoracic duct.

1. common carotid artery.
2. thoracic duct.

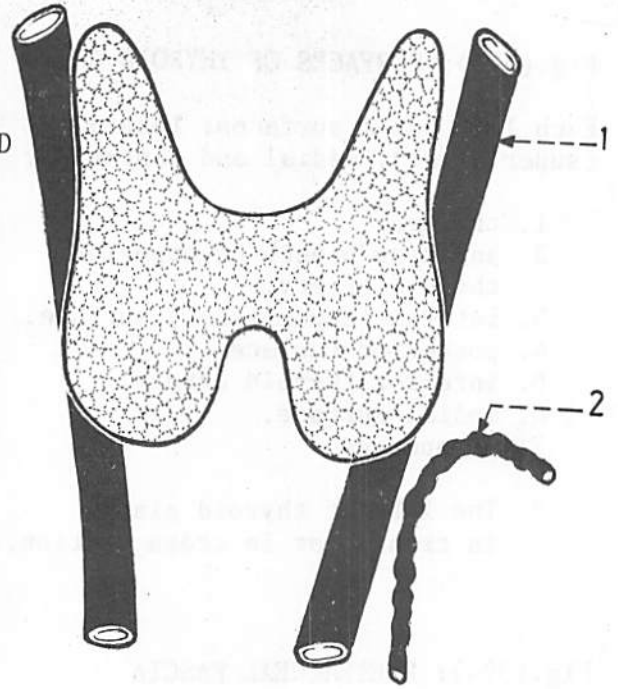


Fig.(397): RELATION OF THE POSTERIOR SURFACE OF THE GLAND TO THE CAROTID SHEATH (T.S.)

1. lobe of the gland (T.S.).
2. carotid sheath.
3. internal jugular vein.
4. vagus nerve.
5. common carotid artery (directly behind the gland).
6. recurrent laryngeal nerve.
7. oesophagus.

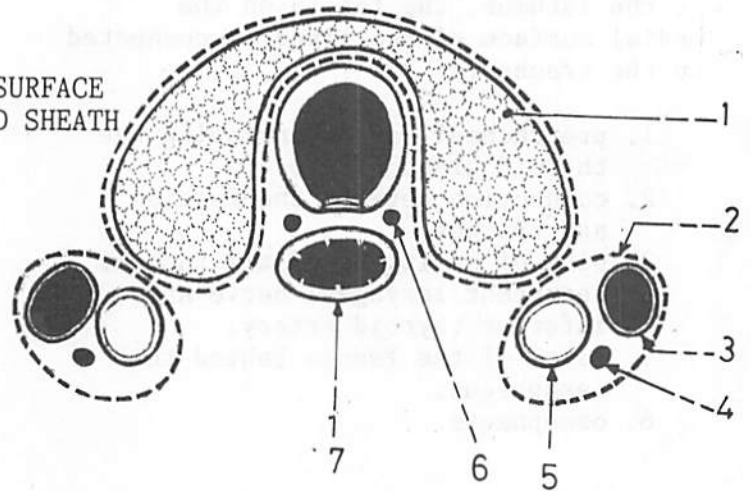
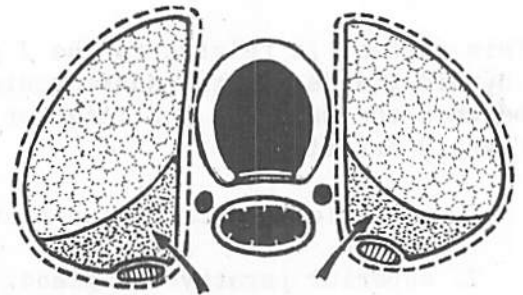


Fig.(398): PARTIAL THYROIDECTOMY

In partial thyroidectomy the anterior part of the gland is removed while its posterior part (marked by arrow) should be left behind to avoid removal of the parathyroid glands.



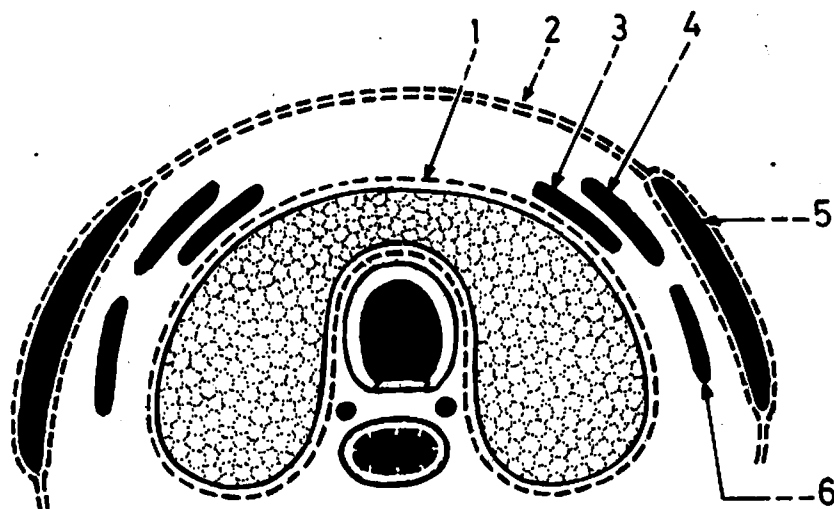


Fig.(399): RELATIONS OF LATERAL SURFACE OF THYROID GLAND (T.S.)

It is covered by the pretracheal fascia and 4 muscles: sternothyroid, superior belly of omohyoid, sternohyoid and sternomastoid.

1. pretracheal fascia.
2. investing layer of deep fascia of the neck.
3. sternothyroid muscle.
4. sternohyoid muscle.
5. sternomastoid muscle.
6. superior belly of omohyoid muscle.

Fig.(400): RELATIONS OF MEDIAL SURFACE OF THYROID GLAND

It is related to the trachea, oesophagus and recurrent laryngeal nerve (below), and to the inferior constrictor muscle of the pharynx, cricothyroid muscle and external laryngeal nerve (above).

1. inferior constrictor muscle of pharynx.
2. external laryngeal nerve.
3. oesophagus.
4. recurrent laryngeal nerve.
5. cricothyroid muscle.
6. trachea.

\* The recurrent laryngeal and external laryngeal nerves may be injured during removal of the thyroid gland.

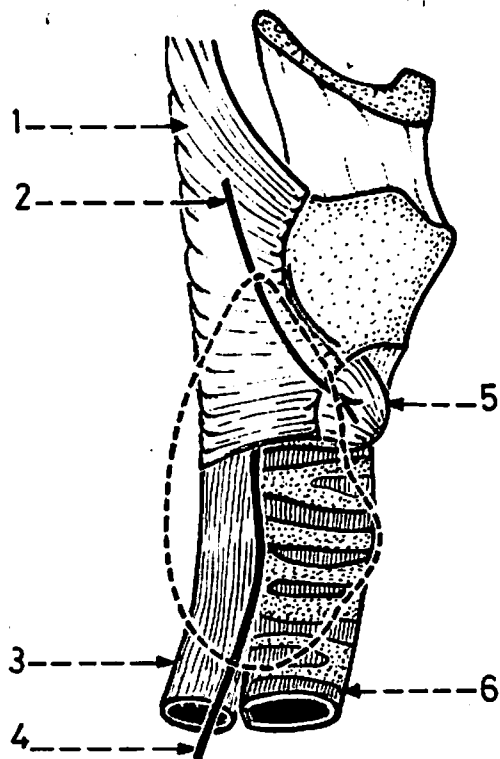




Fig.(401): ARTERIES OF THYROID GLAND

These are 3 arteries: superior thyroid (from external carotid), inferior thyroid (from thyrocervical trunk) and thyroidea ima (from arch of aorta). The superior thyroid artery is accompanied by the external laryngeal nerve while the inferior thyroid artery is accompanied by the recurrent laryngeal nerve near the thyroid gland.

1. superior laryngeal nerve.
2. external carotid artery.
3. common carotid artery.
4. superior thyroid artery.
5. external laryngeal nerve.
6. posterior branch of superior thyroid artery.
7. inferior thyroid artery.
8. thyrocervical trunk.
9. 1st part of subclavian artery.
10. recurrent laryngeal nerve.
11. thyroidea ima (from the arch of aorta).

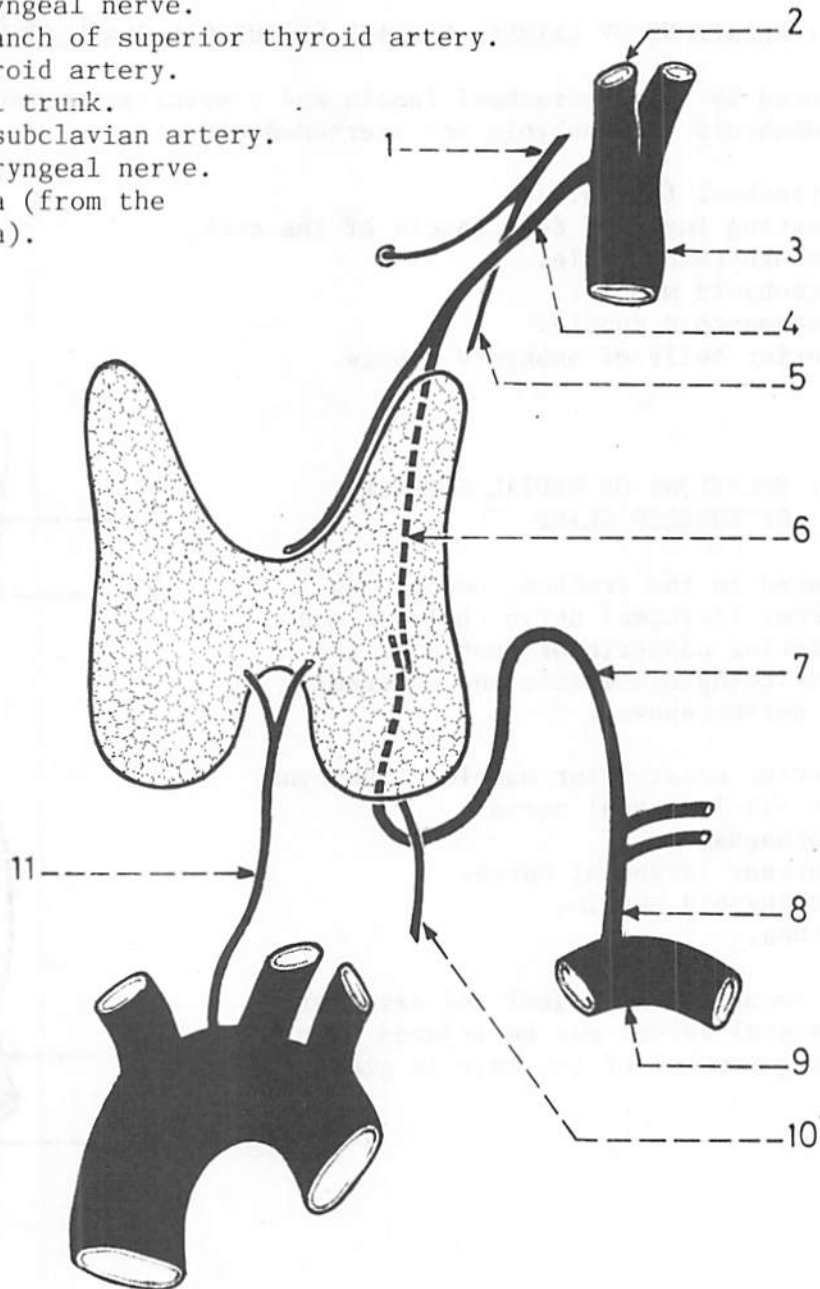




Fig.(402): VEINS OF THYROID GLAND

These are the superior thyroid vein (joins the internal jugular vein), middle thyroid vein (joins the internal jugular vein) and inferior thyroid veins (join the left innominate vein).

1. superior thyroid vein (accompanies the superior thyroid artery).
2. internal jugular vein.
3. middle thyroid vein (the shortest and widest).
4. inferior thyroid veins (descend in front of the trachea).
5. left innominate (brachiocephalic) vein.

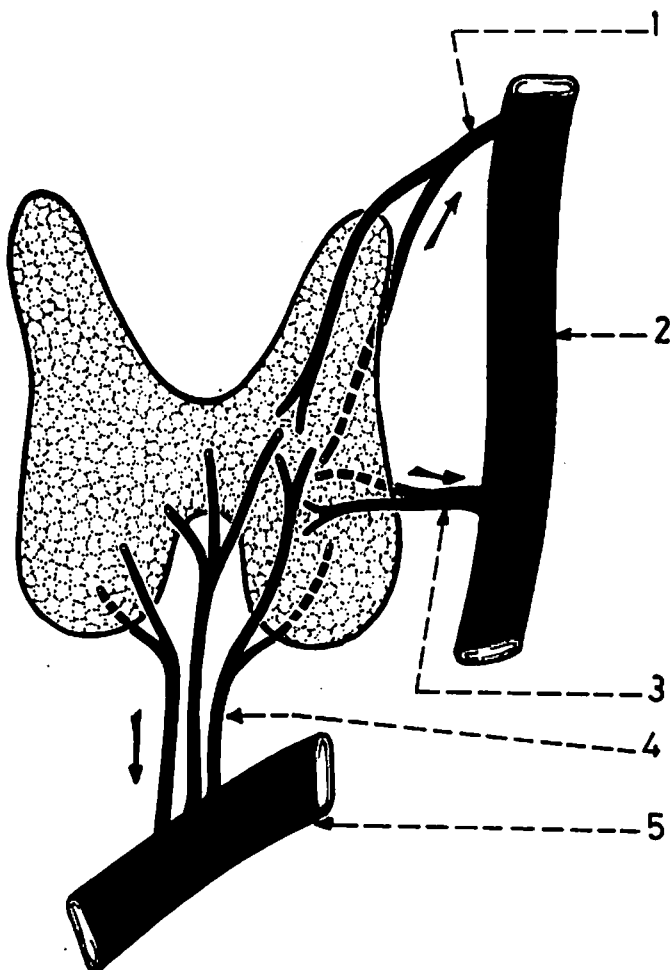
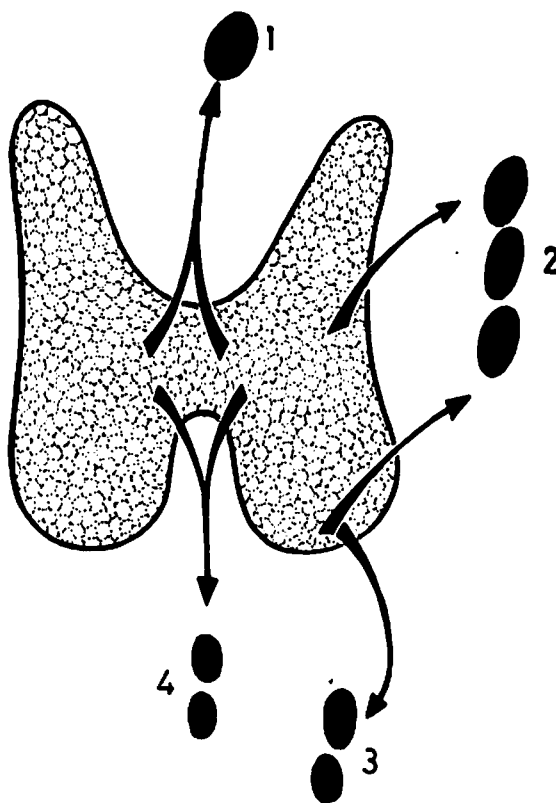


Fig.(403): LYMPHATIC DRAINAGE OF THYROID GLAND

The gland drains into the following lymph nodes: prelaryngeal, pretracheal, lower deep cervical and paratracheal.

1. prelaryngeal node (just above the isthmus).
2. lower deep cervical nodes (along the internal jugular vein).
3. paratracheal nodes (on the side of the trachea along the recurrent laryngeal nerve).
4. pretracheal nodes (in front of the trachea).

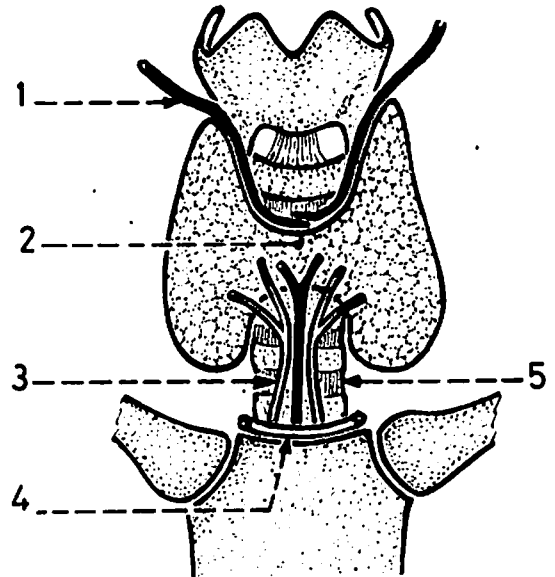


## CERVICAL PART OF THE TRACHEA

**Fig.(404): ANTERIOR RELATIONS OF TRACHEA IN THE NECK**

These are the pretracheal fascia, isthmus of thyroid gland and vessels (jugular arch, inferior thyroid veins, thyroidea ima and anastomosis between the 2 superior thyroid arteries).

1. superior thyroid artery.
2. isthmus of thyroid gland.
3. inferior thyroid veins and thyroidea ima.
4. jugular arch (connects the 2 anterior jugular veins).
5. trachea.

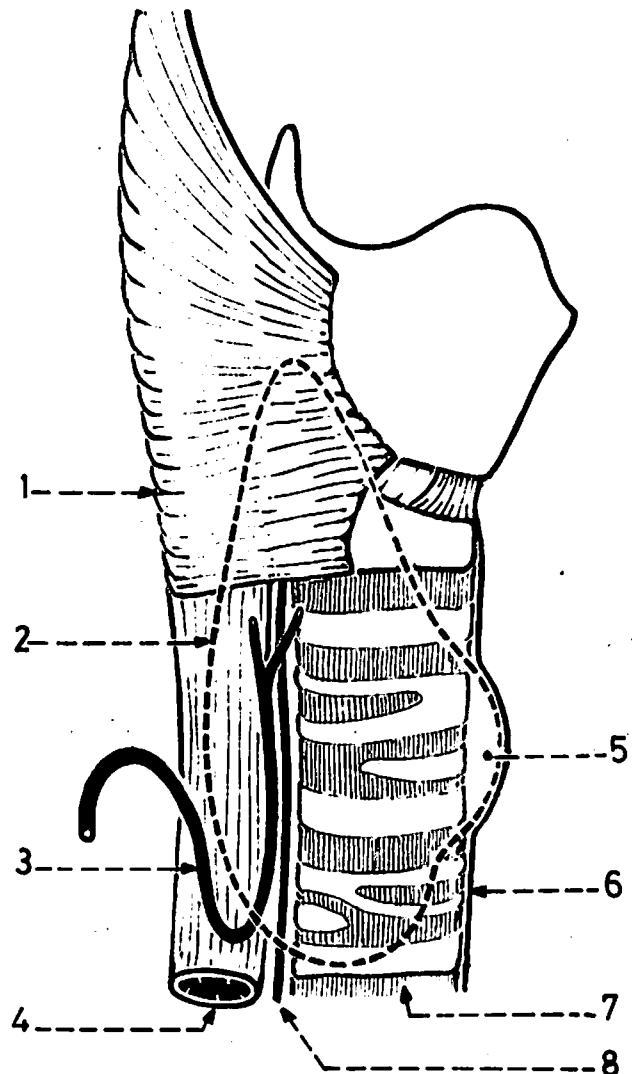


**Fig.(405): POSTERIOR AND LATERAL RELATIONS OF TRACHEA IN THE NECK**

The trachea is related posteriorly to the oesophagus and recurrent laryngeal nerves. It is related laterally to the thyroid gland.

1. inferior constrictor muscle of the pharynx.
2. lobe of thyroid gland.
3. inferior thyroid artery.
4. oesophagus (behind the trachea).
5. isthmus of thyroid gland.
6. pretracheal fascia.
7. cervical part of trachea.
8. recurrent laryngeal nerve (in the groove between the trachea and oesophagus).

\* The trachea lies exactly in the median plane with 1/2 of its length in the neck and the other 1/2 in the chest.



# PLATYSMA AND STERNOMASTOID MUSCLES

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Fig.(406): PLATYSMA

It is a broad thin sheet of muscle situated in the superficial fascia in the side of the neck.

1. cervical branch of facial nerve (supplies the muscle).
2. origin from the deep fascia covering the upper part of pectoralis major.
3. the fibres of the muscle proceed upwards and medially.
4. insertion into the lower border of the mandible. It also blends with the muscles of the angle of the mouth.

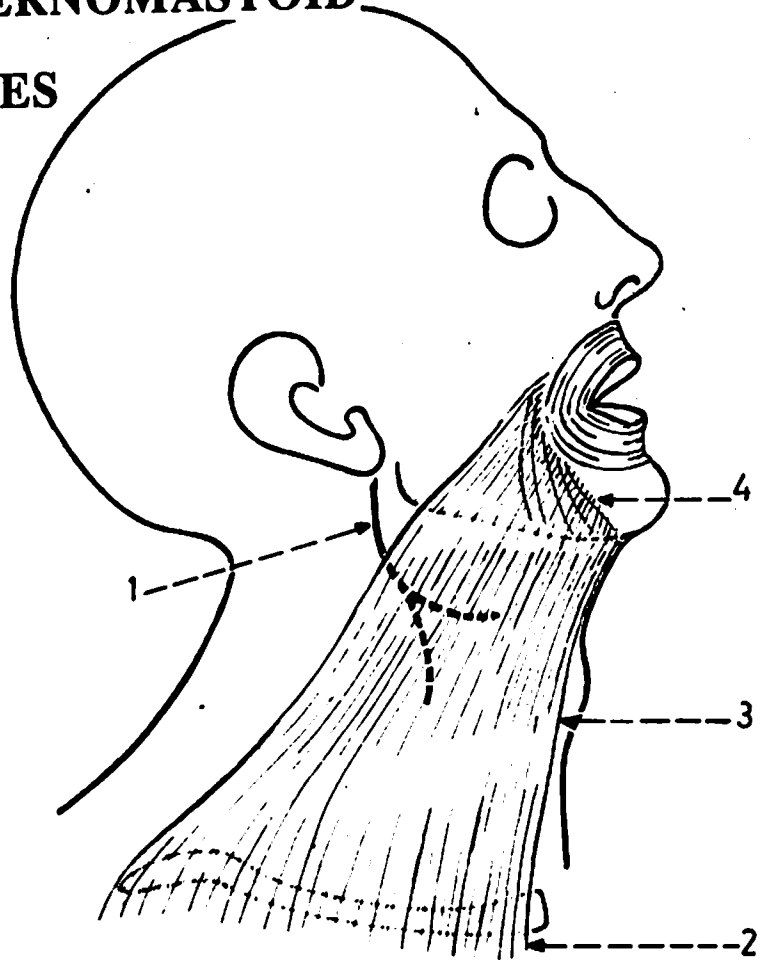
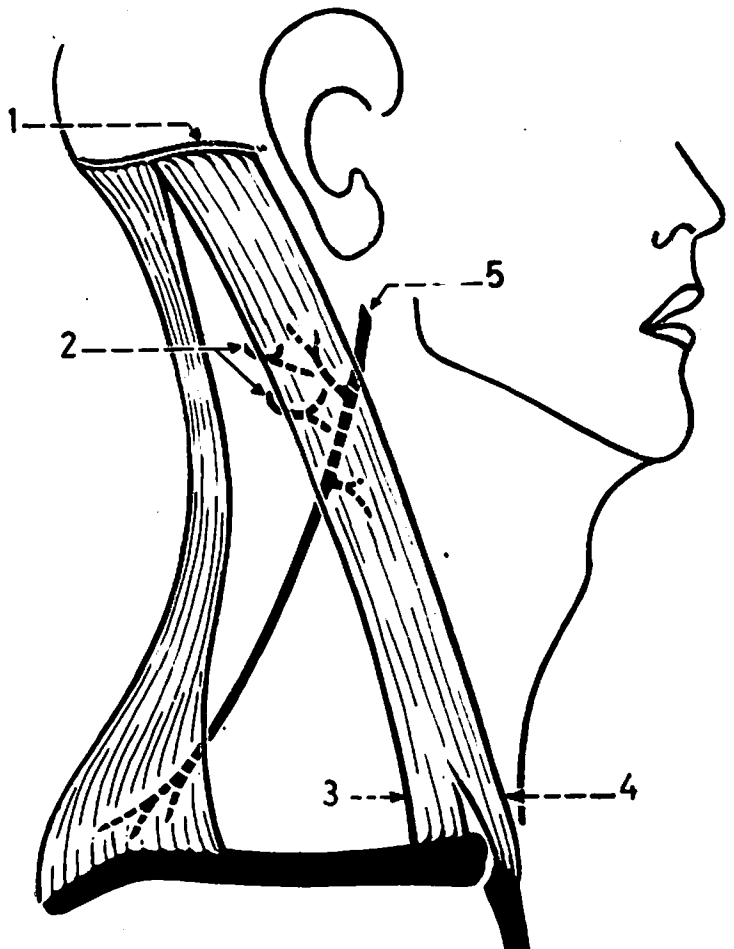


Fig.(407): STERNOMASTOID

It runs obliquely in the side of the neck between the anterior and posterior triangles.

1. insertion into the lateral surface of mastoid process and lateral part of the superior nuchal line.
2. fibres from C.2 and C.3 supplying the muscle.
3. clavicular head of origin (from the upper surface of the medial 1/3 of the clavicle).
4. sternal head of origin (from the upper part of anterior surface of the manubrium sterni).
5. spinal root of accessory nerve (pierces the muscle and supplies it).



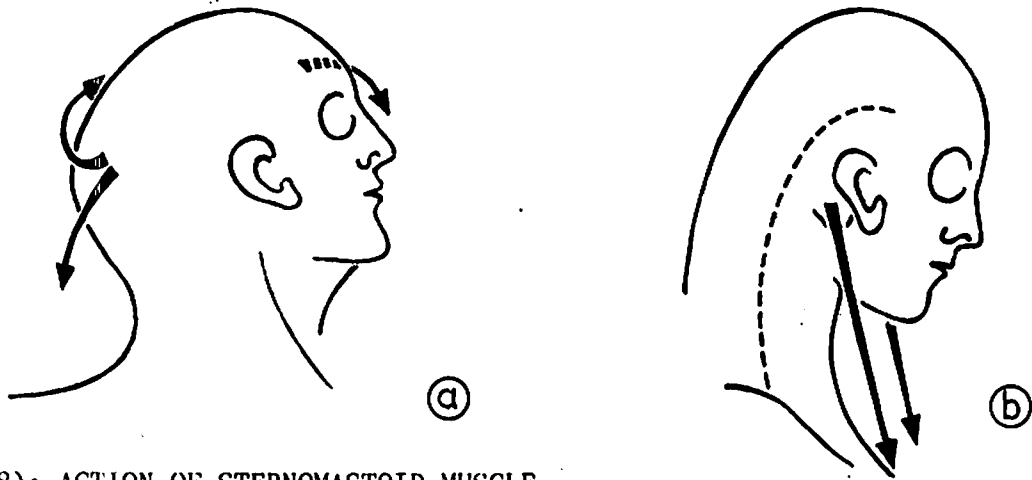


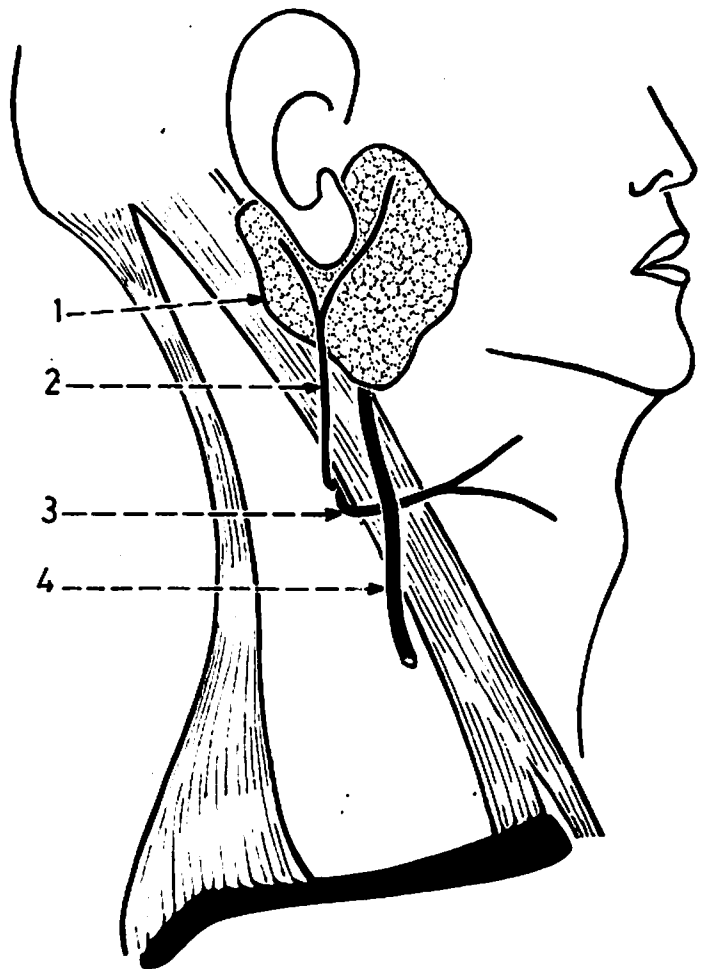
Fig.(408): ACTION OF STERNOMASTOID MUSCLE

- (a) One muscle acting alone: it tilts the head towards the shoulder of the same side and rotates the head so as to direct the face towards the opposite side (in this figure it is the left muscle which is acting).
- (b) The muscles of the 2 sides acting together: they draw the head forwards thus flexing the neck.

Fig.(409): SUPERFICIAL RELATIONS OF STERNOMASTOID MUSCLE

These are the parotid gland, external jugular vein and 2 nerves (great auricular and transverse cutaneous nerve of neck).

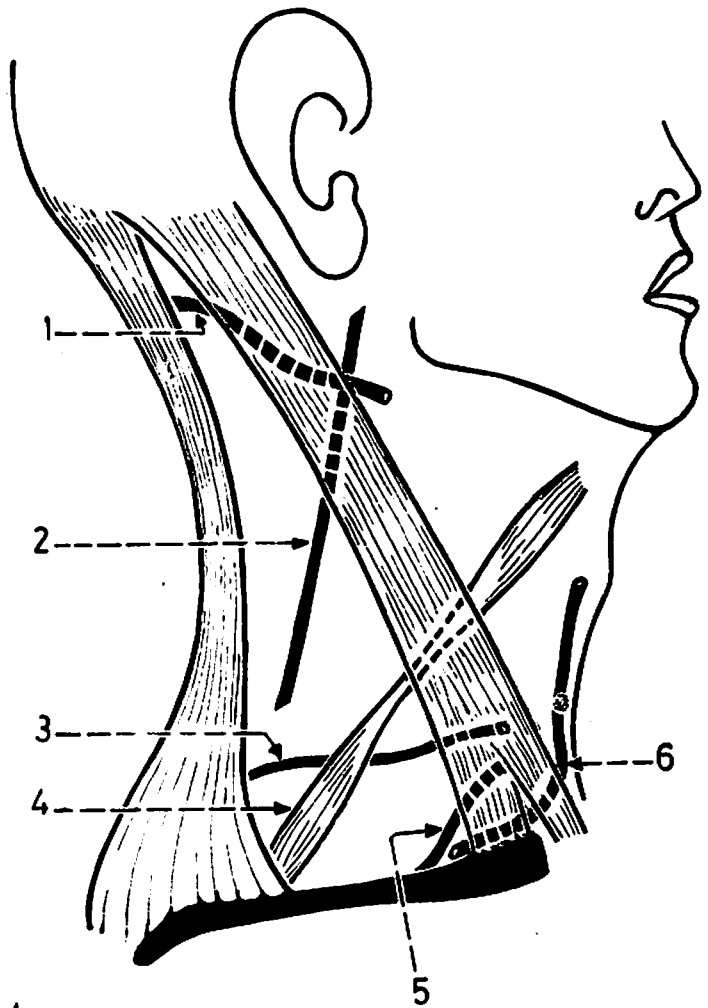
- 1. parotid gland.
- 2. great auricular nerve.
- 3. transverse cutaneous nerve of neck.
- 4. external jugular vein.



**Fig.(410): STRUCTURES CROSSING DEEP TO THE STERNOMASTOID**

These are the occipital artery, accessory nerve, intermediate tendon of omohyoid, transverse cervical artery, suprascapular artery and anterior jugular vein (from above downwards).

1. occipital artery.
2. spinal root of accessory nerve.
3. transverse cervical artery.
4. omohyoid muscle.
5. suprascapular artery.
6. anterior jugular vein.



**Fig.(411): STRUCTURES SITUATED LENGTHWISE DEEP TO THE STERNOMASTOID**

These are the carotid sheath, phrenic nerve and scalenus anterior muscle.

1. phrenic nerve.
2. scalenus anterior.
3. sternomastoid (cut).
4. carotid sheath and its contents.

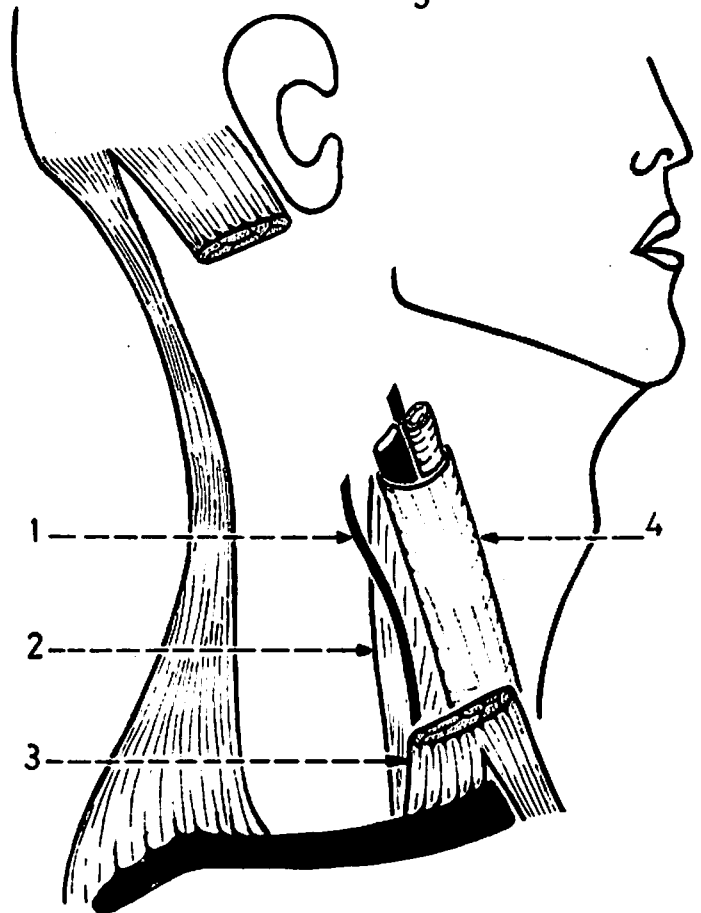


Fig.(412): MUSCLES DEEP TO THE STERNOMASTOID

These are the splenius capitis and posterior belly of digastric (deep to its upper part), and scalenus anterior, intermediate tendon of omohyoid, sternohyoid and sternothyroid (deep to its lower part).

1. splenius capitis.
2. scalenus anterior.
3. intermediate tendon of omohyoid.
4. posterior belly of digastric.
5. lower part of sternohyoid.
6. lower part of sternothyroid.

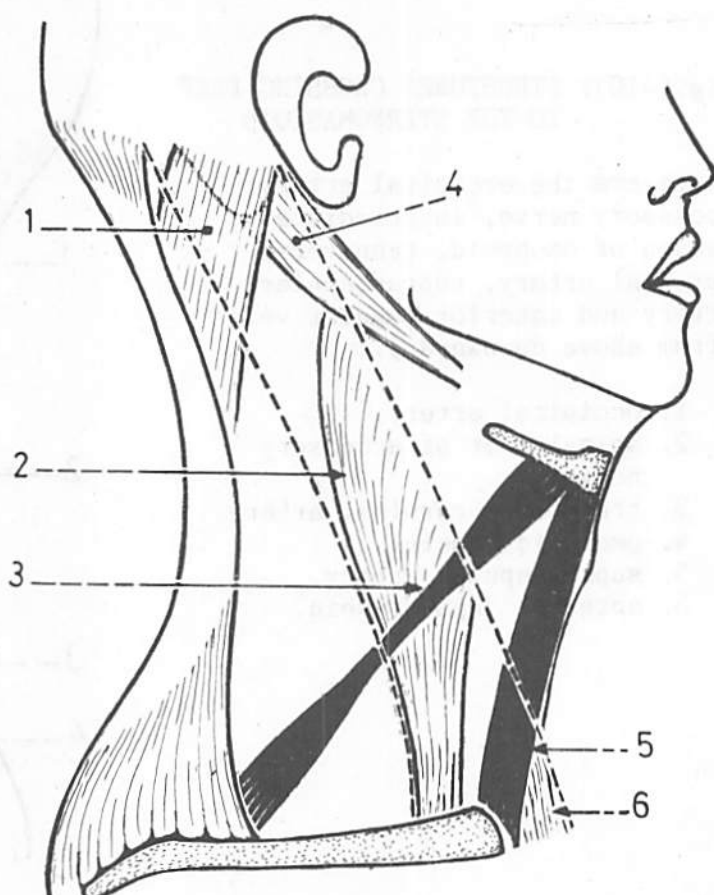
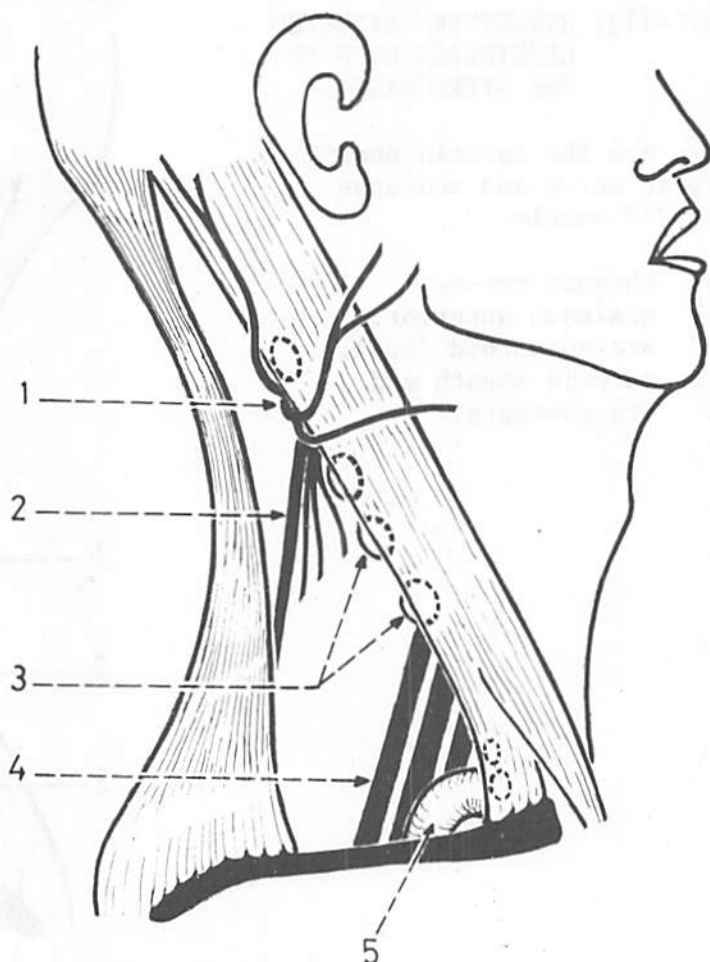


Fig.(413): STRUCTURES AT THE POSTERIOR BORDER OF THE STERNOMASTOID

These are mainly branches of the cervical plexus, accessory nerve, trunks of the brachial plexus and the 3rd part of subclavian artery.

1. branches of cervical plexus.
2. accessory nerve.
3. a chain of deep cervical lymph nodes deep to the posterior border of the muscle.
4. trunks of brachial plexus.
5. 3rd part of subclavian artery.



## PREVERTEBRAL AND LATERAL VERTEBRAL MUSCLES

Fig.(414): PREVERTEBRAL MUSCLES

These are 4 muscles which lie directly in front of the cervical vertebrae. They are the longus colli, longus capitis, rectus capitis anterior and rectus capitis lateralis.

1. rectus capitis anterior.  
(from the anterior surface of the atlas to the basilar part of occipital bone).
2. rectus capitis lateralis  
(from the transverse process of the atlas to the jugular process of occipital bone lateral to the occipital condyle).
3. superior oblique part of longus colli.
4. inferior oblique part of longus colli.
5. base of the skull at the foramen magnum.
6. atlas vertebra.
7. longus capitis (from the transverse processes of cervical vertebrae to the basilar part of occipital bone).

\* The longus colli muscle extends between the bodies of the cervical vertebrae and their transverse processes, hence its name colli.

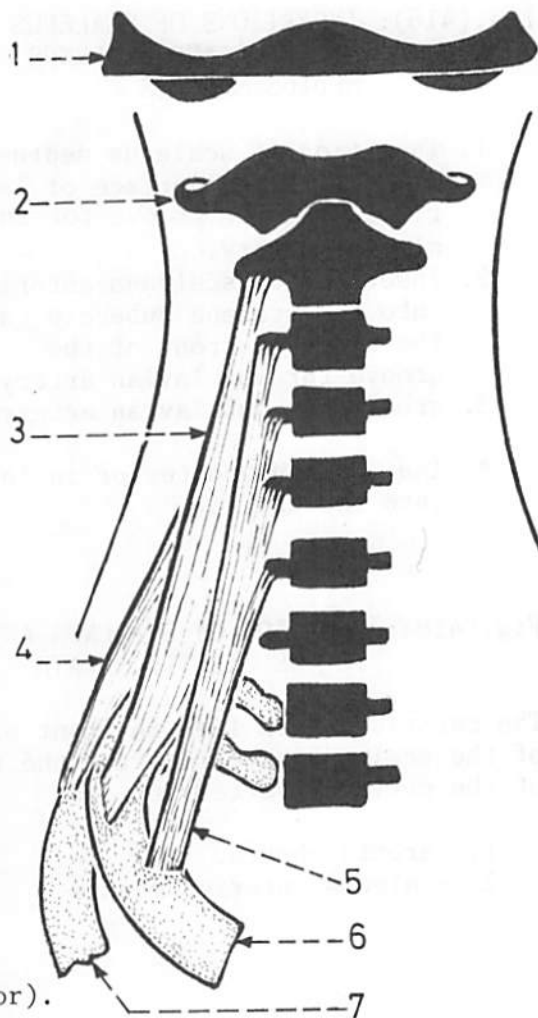
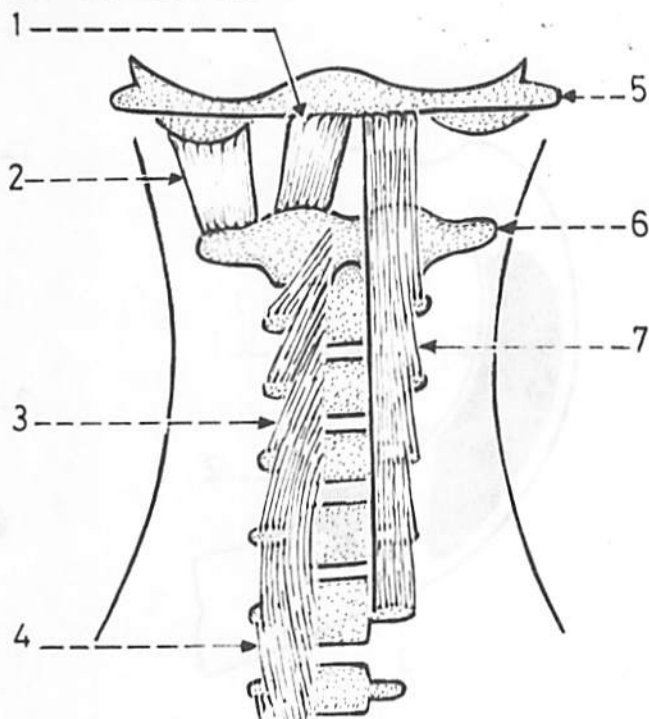


Fig.(415): LATERAL VERTEBRAL MUSCLES.

These are the scalenus anterior, scalenus medius and scalenus posterior (arranged from before backwards).

1. base of the skull.
2. atlas vertebra.
3. scalenus medius (between the scalenus anterior in front, and the scalenus posterior behind).
4. scalenus posterior.
5. scalenus anterior.
6. 1st rib (for insertion of scalenus anterior and scalenus medius).
7. 2nd rib (for insertion of scalenus posterior).

\* The 3 scaleni arise from the transverse processes of cervical vertebrae and are inserted into the 1st and 2nd ribs.

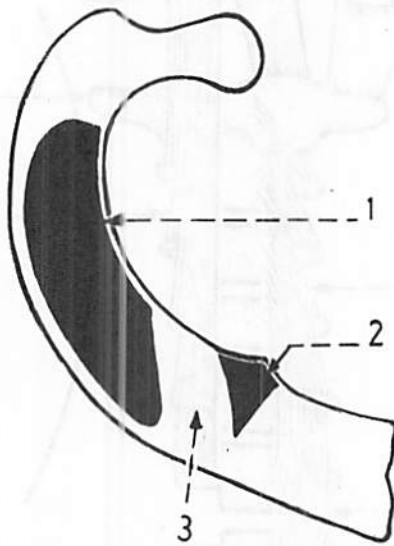


Fig.(416): INSERTIONS OF SCALENUS ANTERIOR AND SCALENUS MEDIUS MUSCLES

1. insertion of scalenus medius into the upper surface of 1st rib behind the groove for subclavian artery.
2. insertion of scalenus anterior into the scalene tubercle and the ridge in front of the groove for subclavian artery.
3. groove for subclavian artery.

\* The scalenus posterior is inserted into the 2nd rib.

Fig.(418): RELATION OF SCALENUS ANTERIOR TO THE CAROTID SHEATH

The carotid sheath lies in front of the origin of the scalenus anterior from the transverse processes of the cervical vertebrae.

1. carotid sheath.
2. scalenus anterior muscle.

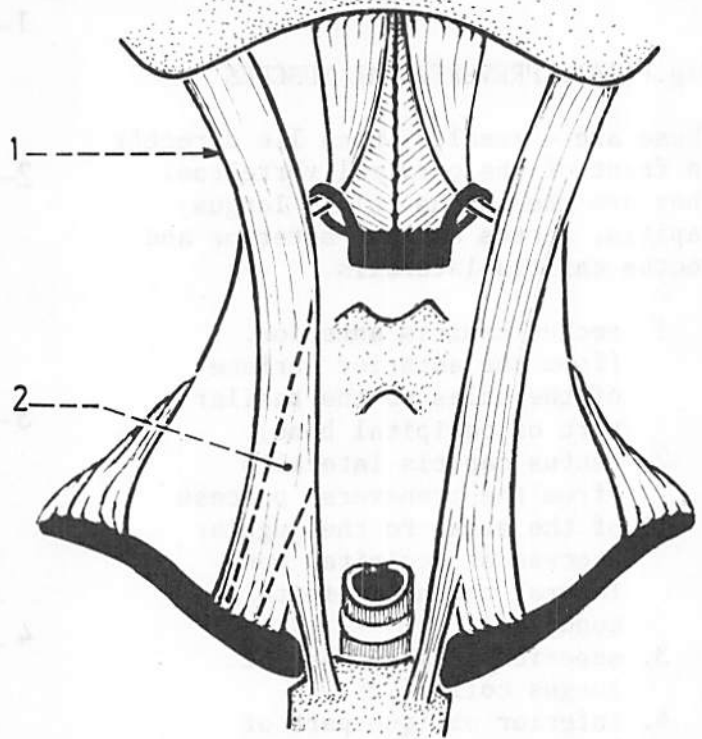
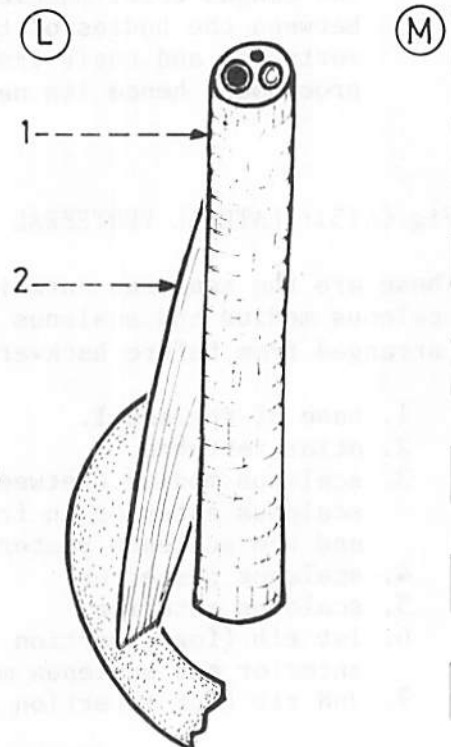


Fig.(417): POSITION OF SCALENUS ANTERIOR

It lies lengthwise behind the lower half of sternomastoid.

1. sternomastoid.
2. scalenus anterior (behind the sternomastoid).





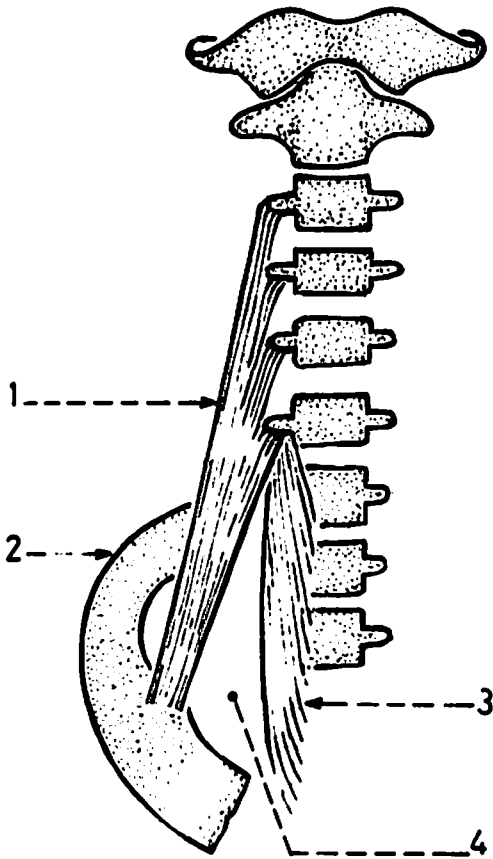


Fig.(419): RELATION OF SCALENUS ANTERIOR TO LONGUS COLLI

The scalenus anterior lies lateral to the longus colli from which it is separated by a triangular interval. In this interval lies important structures such as the vertebral artery and sympathetic ganglia (see fig. 420).

1. scalenus anterior.
2. 1st rib.
3. inferior oblique part of longus colli.
4. triangular interval between the 2 muscles.

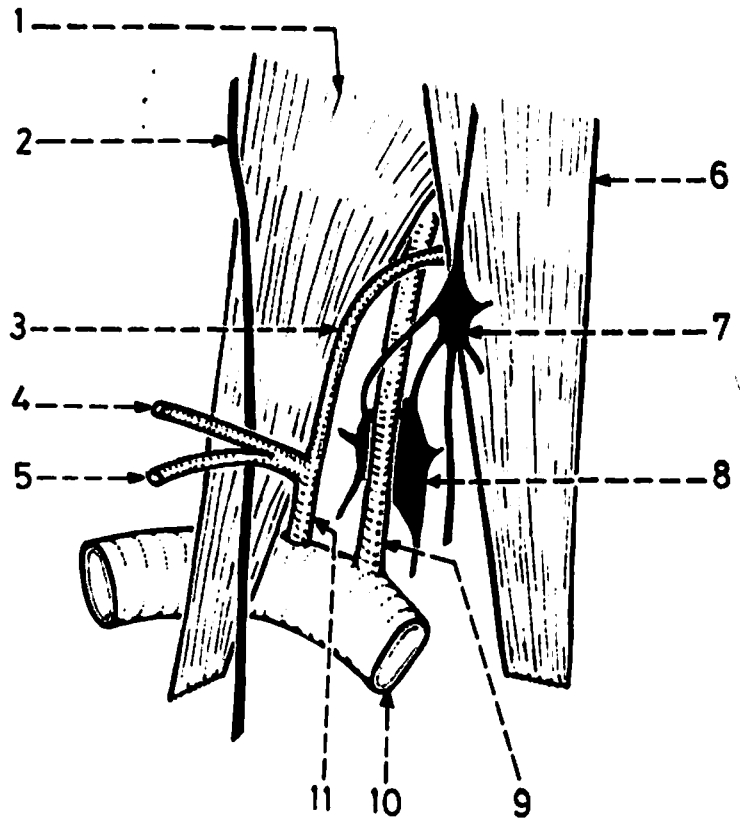


Fig.(420): MEDIAL RELATIONS OF SCALENUS ANTERIOR

These are the 1st part of subclavian artery, thyrocervical trunk and vertebral artery, in addition to the sympathetic trunk and the middle and inferior cervical sympathetic ganglia.

1. scalenus anterior.
2. phrenic nerve (on the anterior surface of scalenus anterior).
3. inferior thyroid artery (crosses the apex of the triangular interval).
4. transverse cervical artery.
5. suprascapular artery.
6. longus colli.
7. middle cervical ganglion.
8. inferior cervical ganglion.
9. vertebral artery (disappears at the apex of the triangular interval).
10. 1st part of subclavian artery.
11. thyrocervical trunk.

Fig.(421): STRUCTURES BETWEEN SCALENUS ANTERIOR AND SCALENUS MEDIUS

These are the 3rd part of subclavian artery and the 3 trunks of brachial plexus. However, the 2nd part of subclavian artery and roots of brachial plexus lie directly behind the scalenus anterior.

1. scalenus medius.
2. trunks of brachial plexus.
3. 3rd part of subclavian artery.
4. subclavian vein.
5. scalenus anterior.

\* Note the triangular interval between the scalenus anterior and scalenus medius.

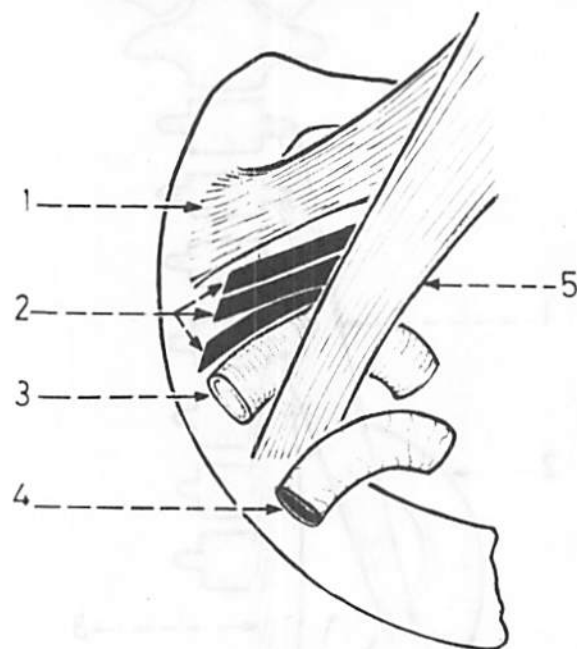
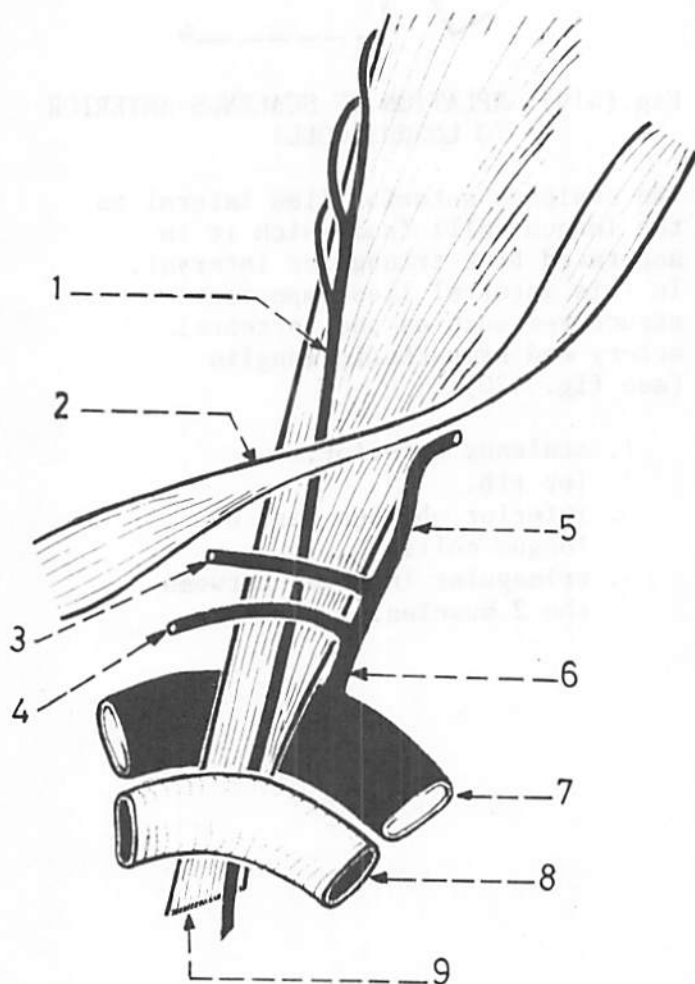


Fig.(422): STRUCTURES IN FRONT OF SCALENUS ANTERIOR

These are many structures: phrenic nerve, omohyoid, transverse cervical and suprascapular arteries and subclavian vein in addition to the sternomastoid muscle.

1. phrenic nerve.
2. intermediate tendon of omohyoid.
3. transverse cervical artery.
4. suprascapular artery.
5. inferior thyroid artery.
6. thyrocervical trunk (along the medial border of the muscle).
7. subclavian artery.
8. subclavian vein.
9. insertion of scalenus anterior.

\* The carotid sheath lies in front of the origin of the scalenus anterior (see fig. 418).

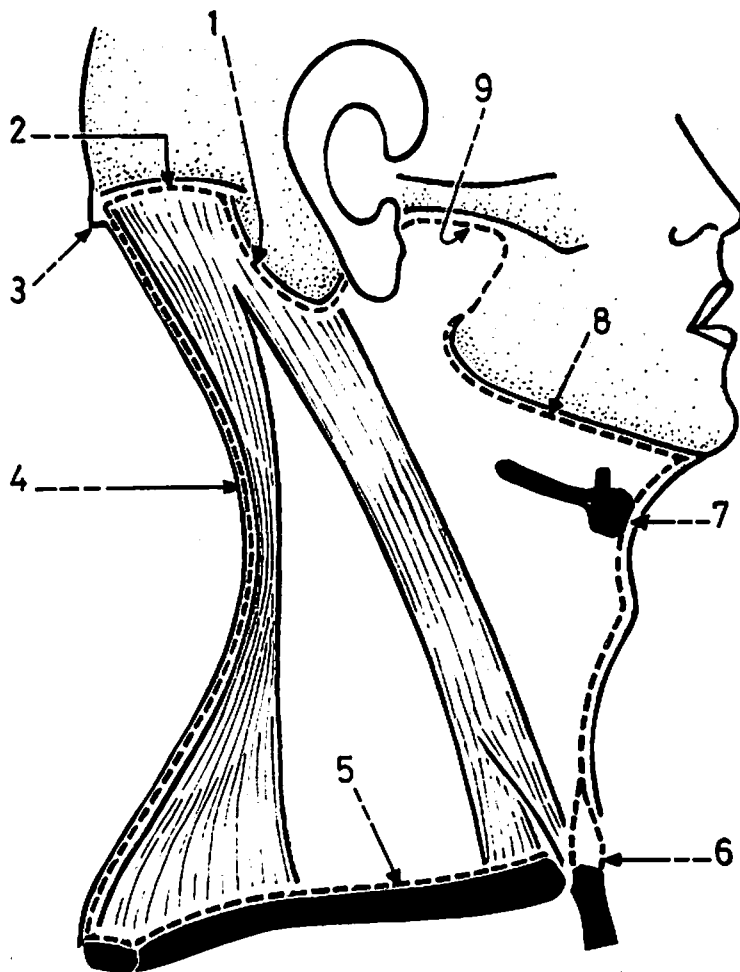


## DEEP CERVICAL FASCIA

The deep fascia of the neck is arranged in the form of 4 layers: investing layer, prevertebral fascia, pretracheal fascia and carotid sheath.

Fig.(423): INVESTING LAYER OF DEEP FASCIA

It lies deep to the superficial fascia and platysma extending from the ligamentum nuchae behind to the anterior midline of the neck in front, and from the base of the mandible, mastoid process and superior nuchal line above to the clavicle and manubrium sterni below. It invests the trapezius and sternomastoid muscles and forms the roof of the posterior triangle.



1. attachment to mastoid process.
2. attachment to superior nuchal line.
3. external occipital protuberance.
4. attachment to ligamentum nuchae.
5. attachment to clavicle.
6. attachment to manubrium sterni (splits to form the suprasternal space).
7. attachment to hyoid bone.
8. attachment to mandible.
9. attachment to zygomatic arch.

Fig.(424): INVESTING FASCIA (T.S.)

1. investing fascia.
2. sternomastoid.
3. inferior belly of omohyoid.
4. fascia of the roof of the posterior triangle.
5. trapezius.
6. ligamentum nuchae.

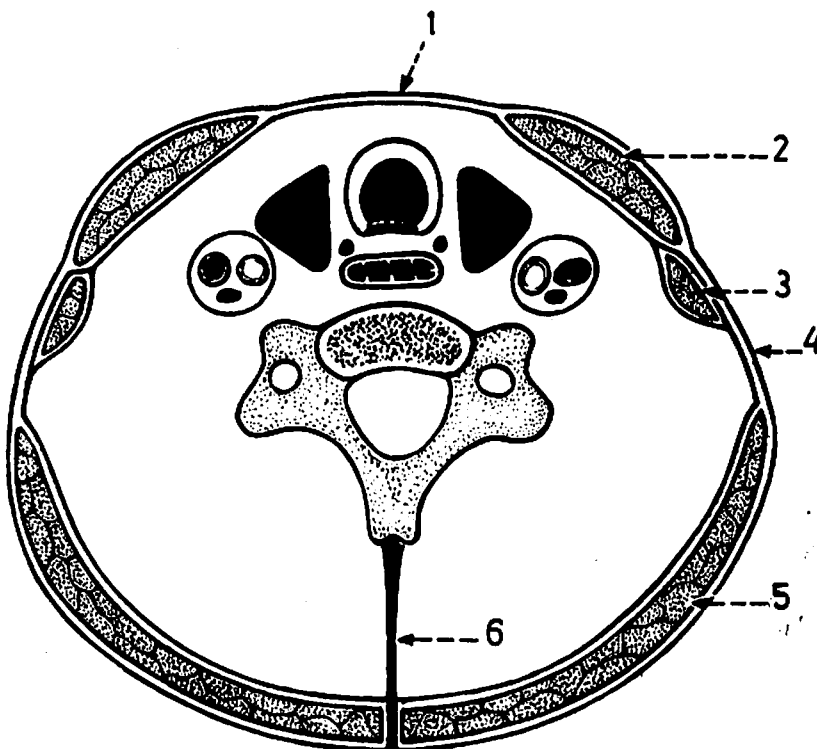


Fig.(425): PREVERTEBRAL FASCIA

It covers the prevertebral muscles and extends laterally on each side behind the carotid sheath and in front of the scalene muscles to form the fascial floor of the posterior triangle.

1. investing fascia.
2. thyroid gland.
3. sternomastoid.
4. carotid sheath.
5. posterior triangle.
6. scalene muscles.
7. prevertebral fascia in the floor of the posterior triangle.
8. prevertebral fascia extending laterally behind the carotid sheath.

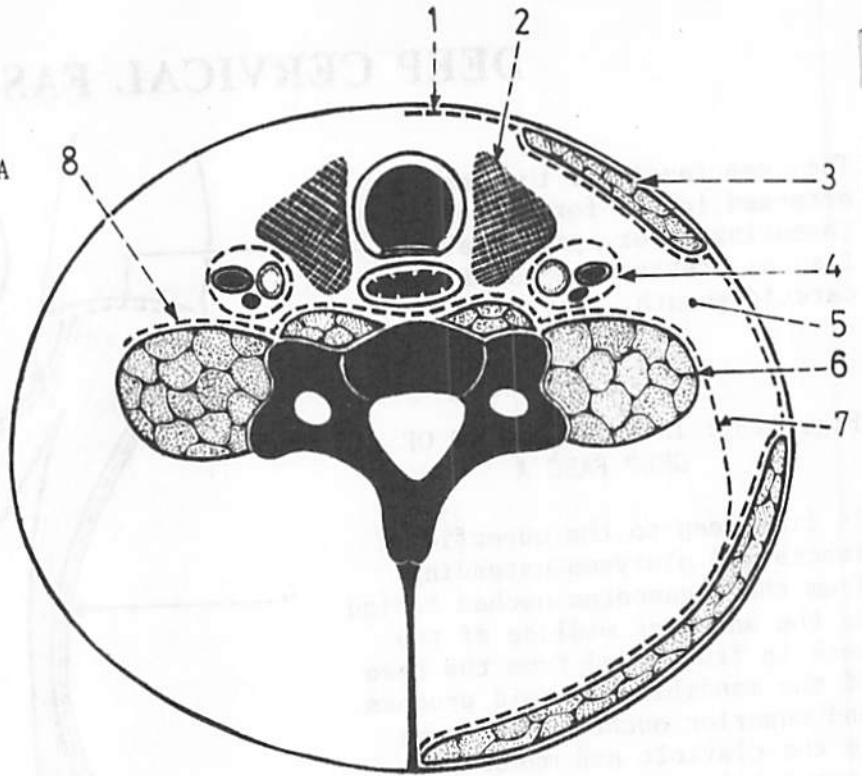


Fig.(426): AXILLARY SHEATH

At the lower part of the posterior triangle, the prevertebral fascia ensheathes the subclavian artery and the brachial plexus and accompanies them behind the clavicle forming the axillary sheath.

1. floor of posterior triangle covered by an extension from the prevertebral fascia.
2. axillary sheath surrounding the subclavian artery and the brachial plexus.

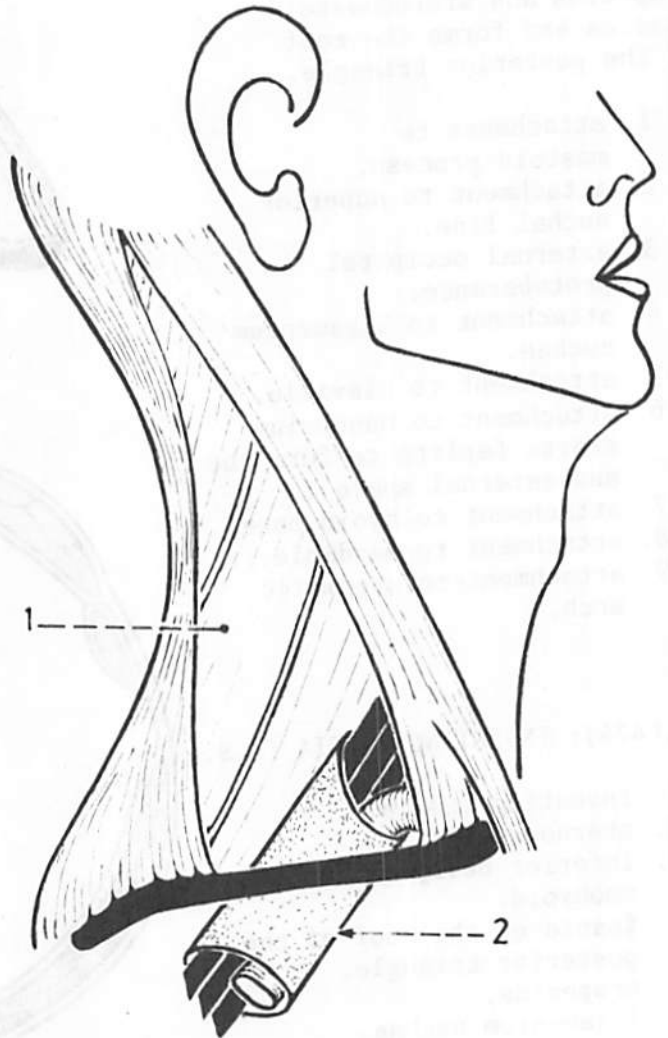


Fig.(427): PRETRACHEAL FASCIA

- It extends from the cricoid cartilage above to the superior mediastinum below. It forms a sheath to the thyroid gland and extends in front of the trachea as far down as the posterior surface of the pericardium.

1. hyoid bone.
2. cricoid cartilage.
3. isthmus of thyroid gland enclosed within the pretracheal fascia.
4. pretracheal fascia.
5. superior mediastinum behind the manubrium sterni.
6. pericardium.
7. trachea.
8. oesophagus.
9. prevertebral fascia.

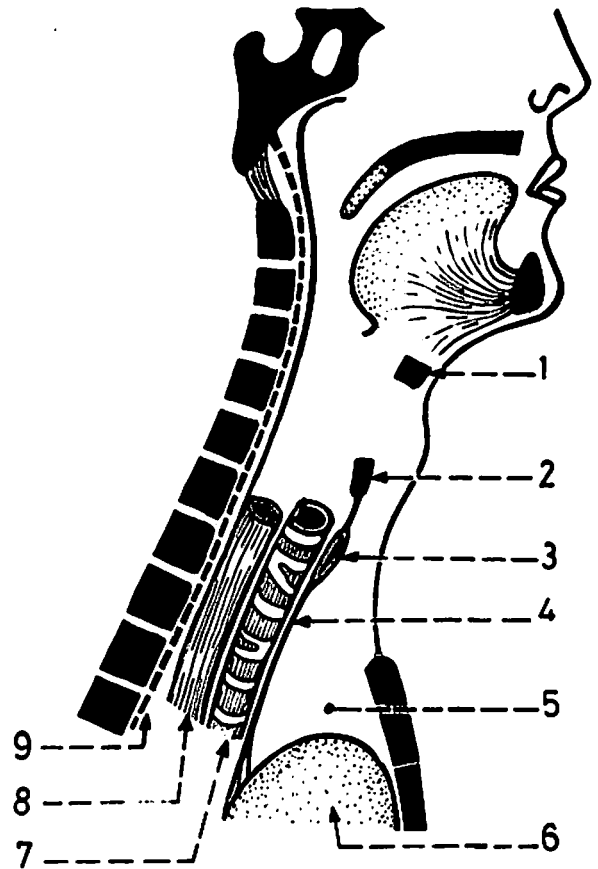
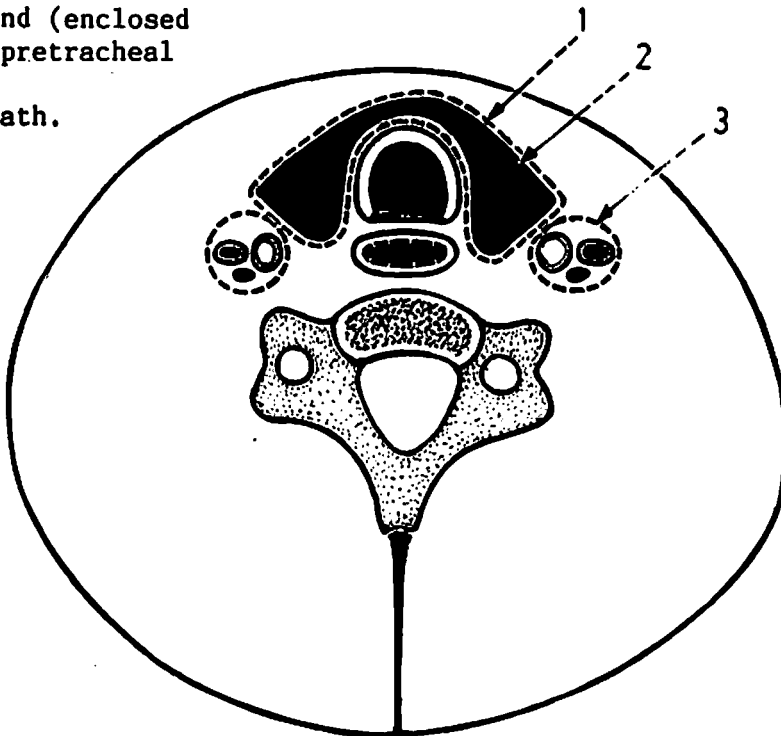


Fig.(428): PRETRACHEAL FASCIA ENCLOSING THE THYROID GLAND (T.S.)

1. pretracheal fascia.
2. thyroid gland (enclosed within the pretracheal fascia).
3. carotid sheath.



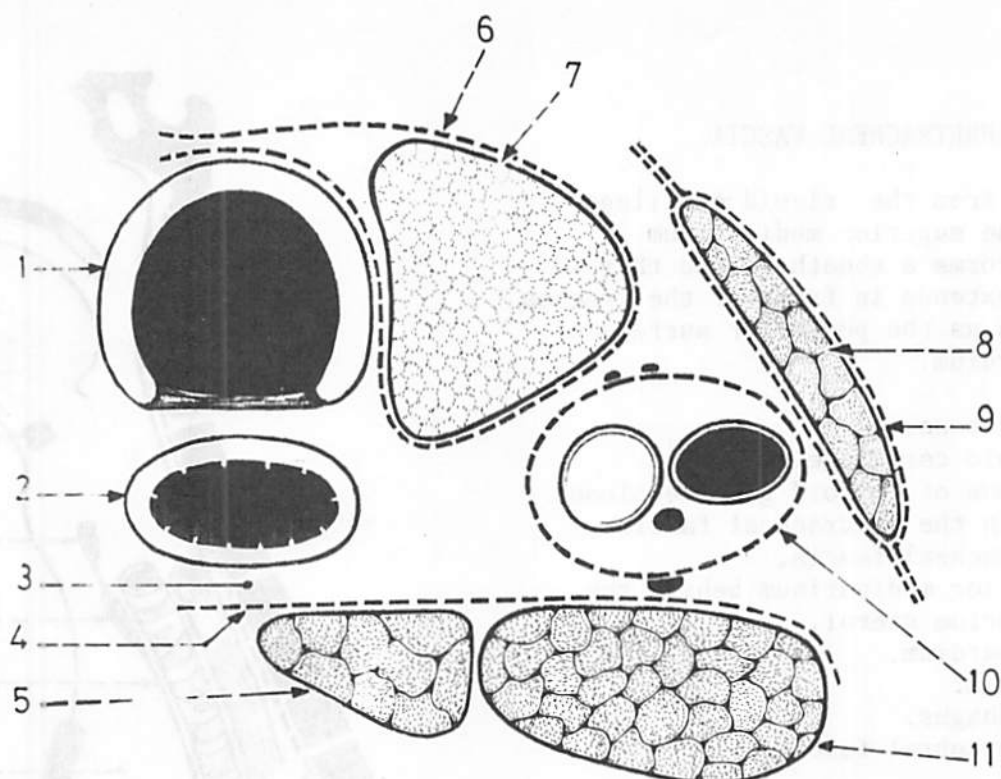


Fig.(429): CAROTID SHEATH (T.S.)

It encloses the common carotid artery and its continuation the internal carotid, internal jugular vein and vagus nerve. The constituents of the ansa cervicalis are embedded in its wall. The carotid sheath lies in the interval bounded by the pretracheal, prevertebral and investing layers of fascia.

1. trachea.
2. oesophagus.
3. retropharyngeal space.
4. prevertebral fascia.
5. prevertebral muscles.
6. pretracheal fascia.
7. thyroid gland.
8. sternomastoid.
9. investing fascia.
10. carotid sheath.
11. lateral vertebral muscle (scaleni).

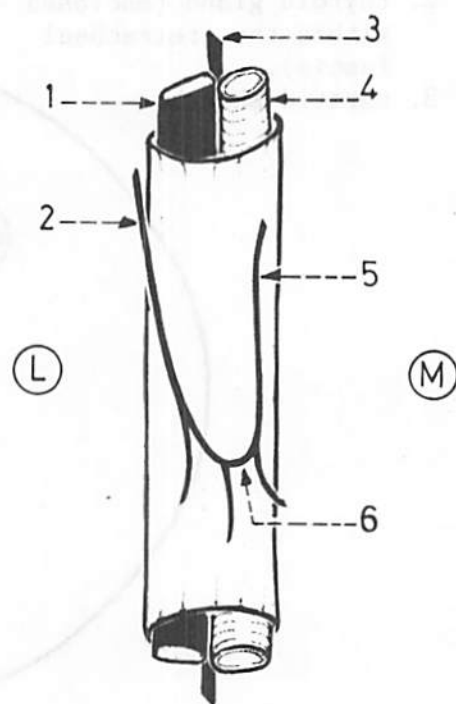


Fig.(430): CAROTID SHEATH TO SHOW ITS CONTENT

1. internal jugular vein (lateral).
2. descendens cervicalis.
3. vagus nerve (in the interval behind the vessels).
4. common carotid artery.
5. descendens hypoglossi.
6. ansa cervicalis.

Fig.(431): DIRECTION OF FLOW OF PUS IN  
THE FASCIAL SPACES OF THE NECK

- (a) Pus in the space between the pretracheal fascia and investing layer of deep fascia: it passes downwards to the superior mediastinum and may point on the front of the neck above the manubrium sterni.
- (b) Pus in the retropharyngeal space between the pharynx and the prevertebral fascia: it passes downwards behind the oesophagus to the posterior mediastinum.

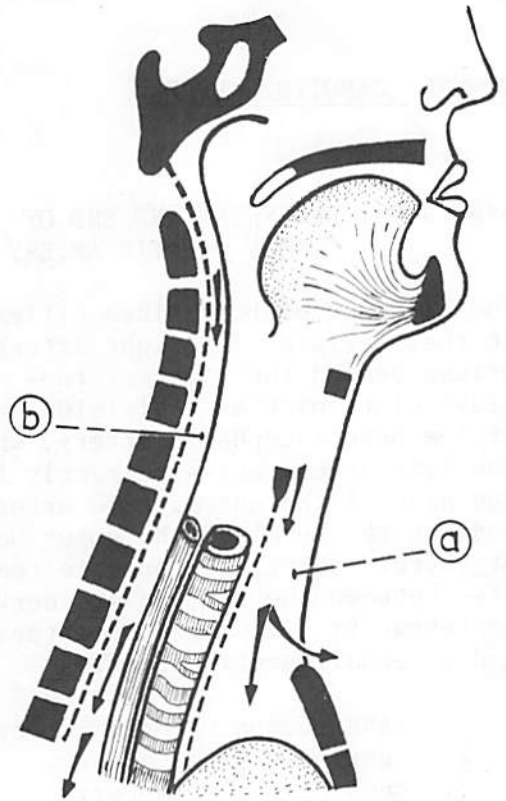
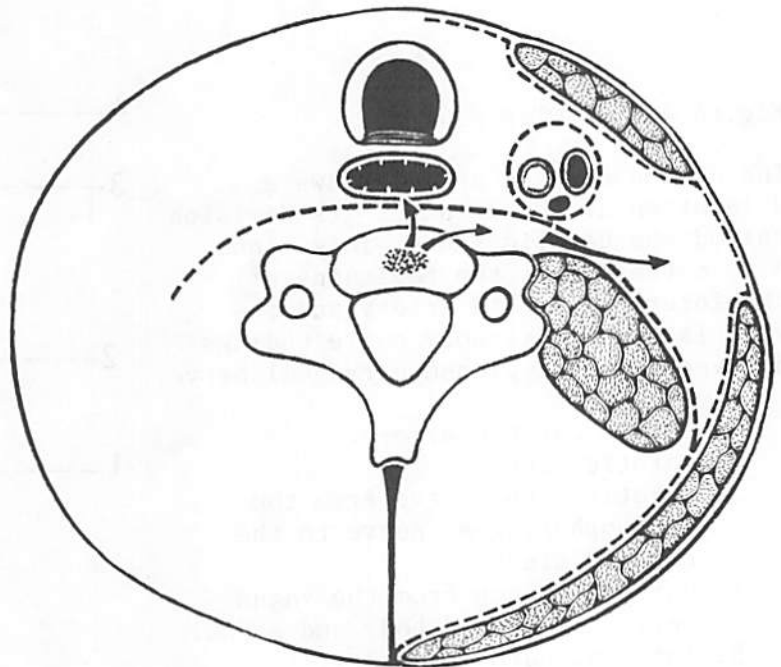


Fig.(432): DIRECTION OF FLOW OF PUS  
FROM CARIES OF CERVICAL VERTEBRAE

Pus from cervical vertebrae flows either forwards to reach the retropharyngeal space or laterally to reach the posterior triangle of the neck. To reach these spaces, pus must penetrate the prevertebral fascia.





## CAROTID ARTERIES

### COMMON CAROTID ARTERY

Fig.(433): BEGINNING AND END OF  
COMMON CAROTID ARTERY

The arteries of both sides differ in their origin. The right artery arises behind the right sterno-clavicular joint as a division of the brachiocephalic artery, while the left artery arises directly from the arch of the aorta. Each artery ends at the level of the upper border of thyroid cartilage opposite the disc between the 3rd and 4th cervical vertebrae by dividing into external and internal carotid arteries.

1. right common carotid artery.
2. right subclavian artery.
3. brachiocephalic artery.
4. termination of common carotid artery at the upper border of thyroid cartilage.
5. left common carotid artery (from the arch of aorta).
6. left subclavian artery.
7. arch of aorta.

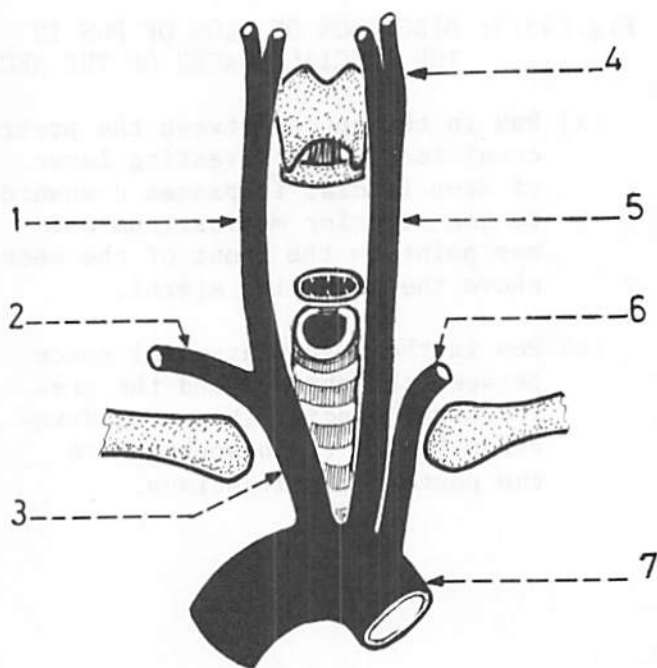


Fig.(434): CAROTID SINUS

The common carotid artery shows a dilatation at the point of its division called the carotid sinus. This sinus also extends into the beginning of the internal carotid artery and its wall is rich in sensory nerve endings derived from the glossopharyngeal nerve.

1. common carotid artery.
2. carotid sinus.
3. carotid sinus nerve from the glossopharyngeal nerve to the carotid sinus.
4. carotid branch from the vagus nerve to carotid body and sinus.
5. internal carotid artery.
6. carotid body (chemoreceptor).
7. external carotid artery.

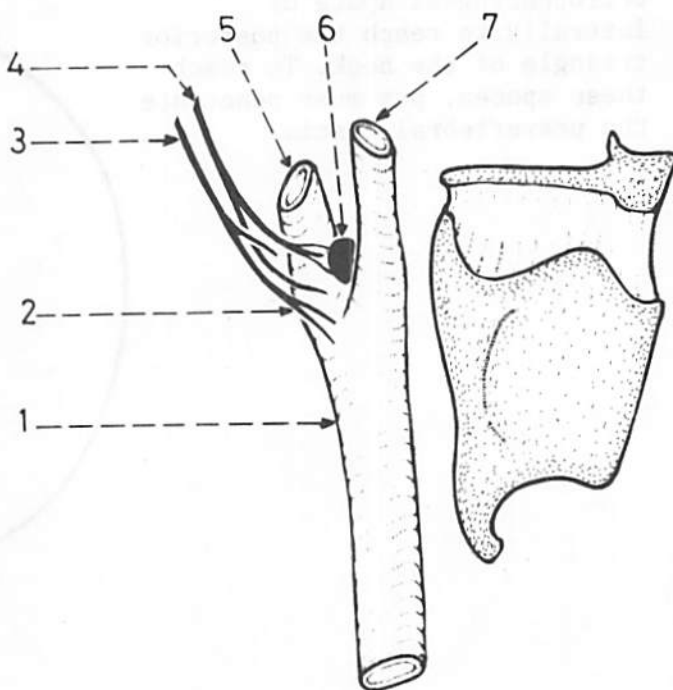




Fig.(435): MUSCLES OVERLYING THE COMMON CAROTID ARTERY

The upper part of the artery is covered only by the sternomastoid, while its lower part is covered by 4 muscles: sternothyroid, sternohyoid, superior belly of omohyoid and sternomastoid.

1. upper part of sternomastoid.
2. common carotid artery.
3. sternothyroid muscle.
4. sternohyoid muscle.
5. lower part of sternomastoid.

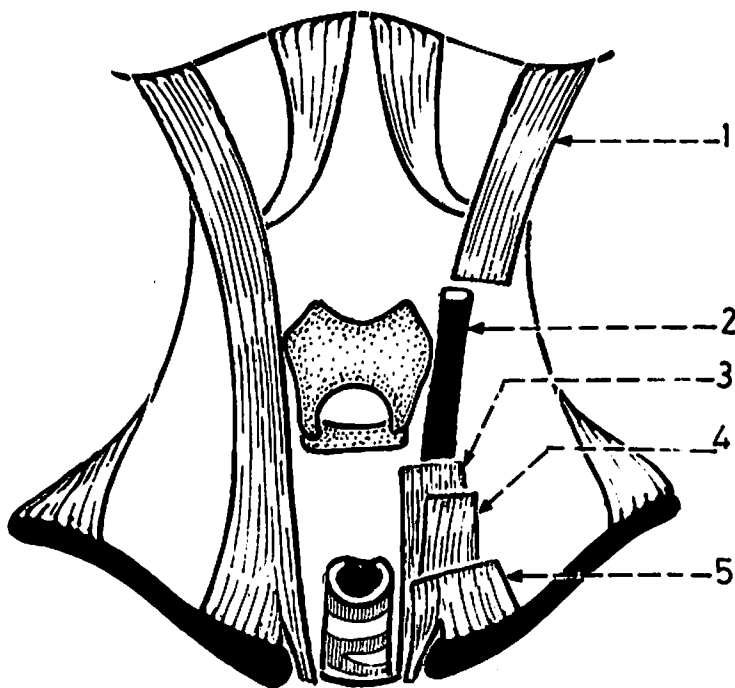


Fig.(436): VESSELS AND NERVES IN FRONT OF THE COMMON CAROTID ARTERY

The common carotid artery (C.C.A.) is related anteriorly to the descendens hypoglossi and 3 veins (superior thyroid, middle thyroid and anterior jugular).

1. descendens hypoglossi (a branch from the hypoglossal nerve).
2. descendens cervicalis (from C.2 and C.3).
3. ansa cervicalis.
4. internal jugular vein (lateral to the artery).
5. sternothyroid muscle.
6. sternohyoid muscle.
7. superior thyroid vein.
8. middle thyroid vein.
9. common carotid artery.

\* The common carotid artery, internal jugular vein and vagus nerve are enclosed within the carotid sheath of deep cervical fascia.

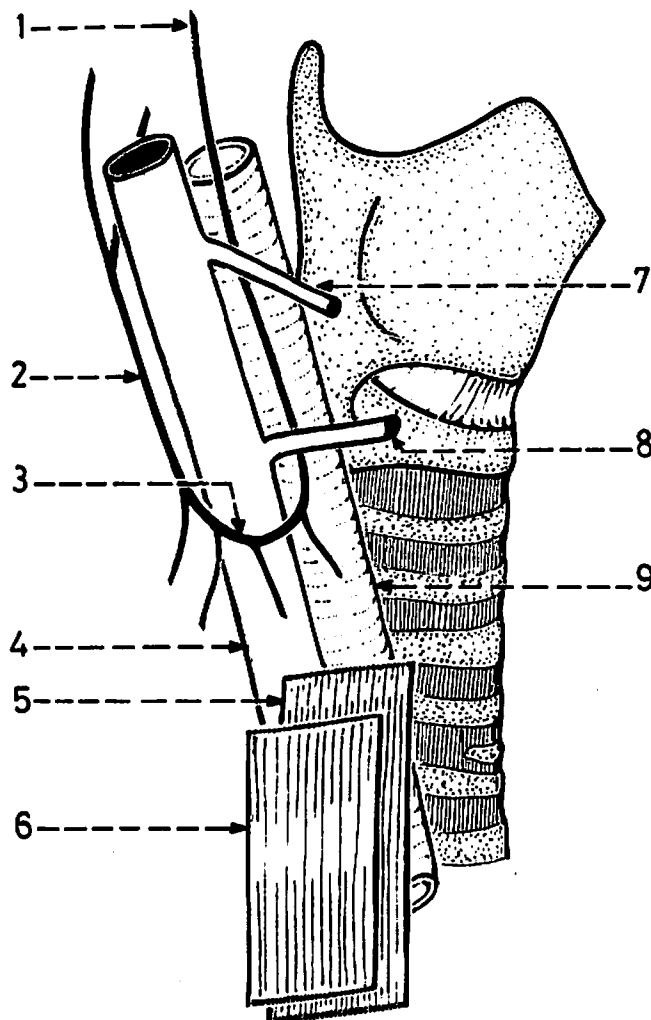


Fig.(437): MEDIAL RELATIONS OF THE COMMON CAROTID ARTERY

It is related below to the trachea and oesophagus and above to the larynx and pharynx.

1. wall of the pharynx.
2. common carotid artery.
3. oesophagus.
4. trachea.
5. cartilages of the larynx.

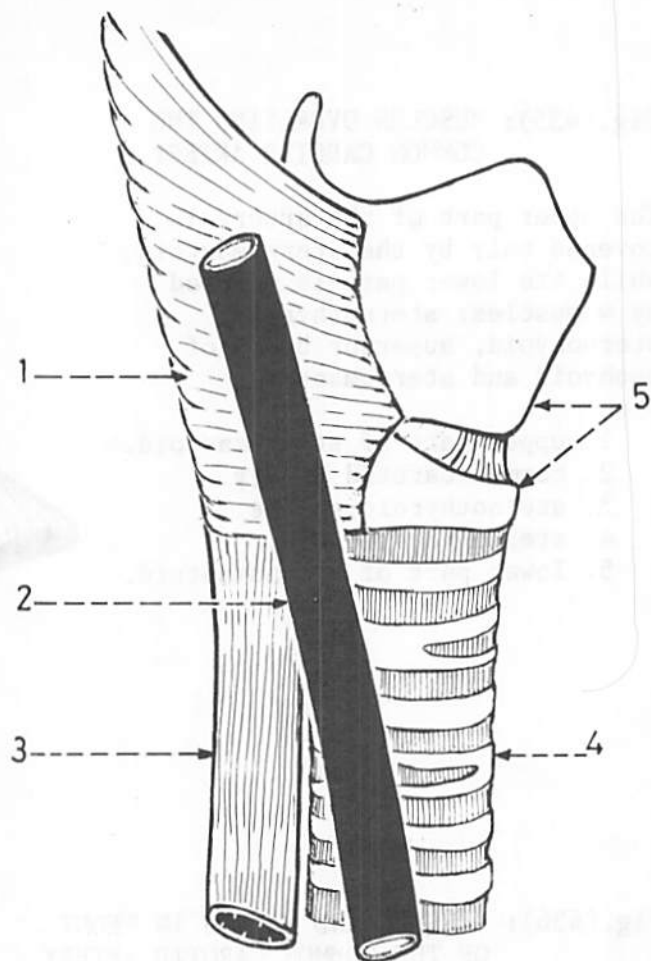
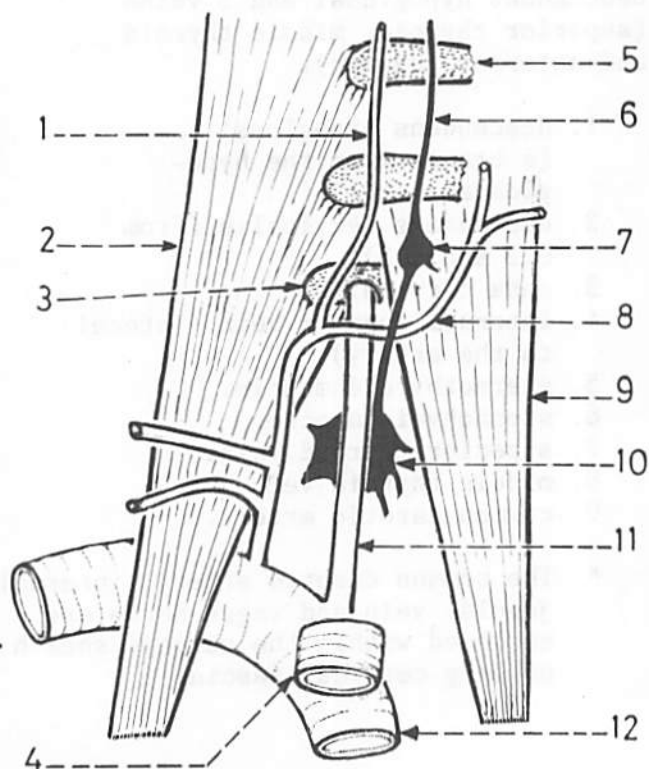


Fig.(438): POSTERIOR RELATIONS OF THE COMMON CAROTID ARTERY

The artery lies in front of 4 arteries: subclavian artery, vertebral artery, inferior thyroid artery and ascending cervical artery. In addition, it lies in front of the sympathetic trunk and origin of the scalenus anterior muscle from the transverse processes of cervical vertebrae from 4 to 6.

1. ascending cervical artery.
2. scalenus anterior muscle.
3. transverse process of 6th C.V.
4. beginning of the right common carotid artery.
5. transverse process of 4th C.V.
6. sympathetic trunk.
7. middle cervical ganglion.
8. inferior thyroid artery.
9. longus colli muscle.
10. inferior cervical ganglion.
11. vertebral artery (in the interval between scalenus anterior and longus colli).
12. beginning of right subclavian artery.

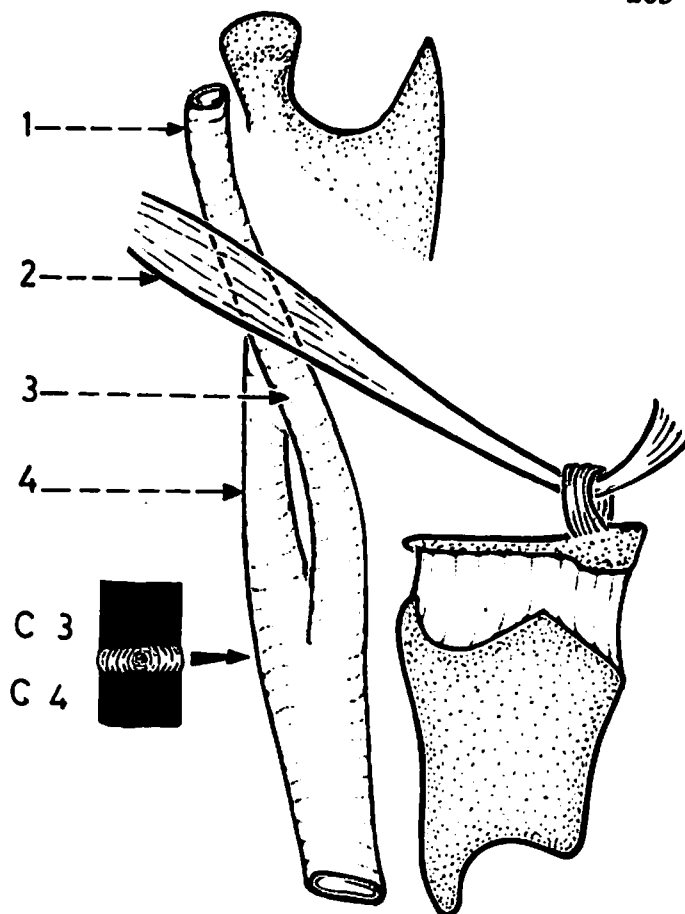


## EXTERNAL CAROTID ARTERY

**Fig.(439): COURSE OF EXTERNAL CAROTID ARTERY**

It begins at the upper border of thyroid cartilage opposite the disc between the 3rd and 4th C.V. It passes upwards and forwards in the carotid triangle, and then leaves the triangle by passing under cover of the posterior belly of the digastric to enter the parotid gland. The upper part of the artery inclines backwards to lie superficial to the internal carotid artery. It ends at the neck of the mandible by dividing into maxillary and superficial temporal branches.

1. part of external carotid artery in the parotid gland.
2. posterior belly of digastric.
3. part of external carotid artery in the carotid triangle.
4. internal carotid artery.



**Fig.(440): PART OF EXTERNAL CAROTID ARTERY IN THE PAROTID GLAND**

The artery pierces the postero-medial surface of the parotid gland and ascends within its substance behind the ramus of the mandible. It ends behind the neck of the mandible by dividing into maxillary and superficial temporal branches.

1. external carotid artery.
2. superficial temporal artery.
3. transverse facial artery.
4. maxillary artery.
5. parotid gland.

\* The artery is called external carotid because it supplies the structures outside the cranial cavity.

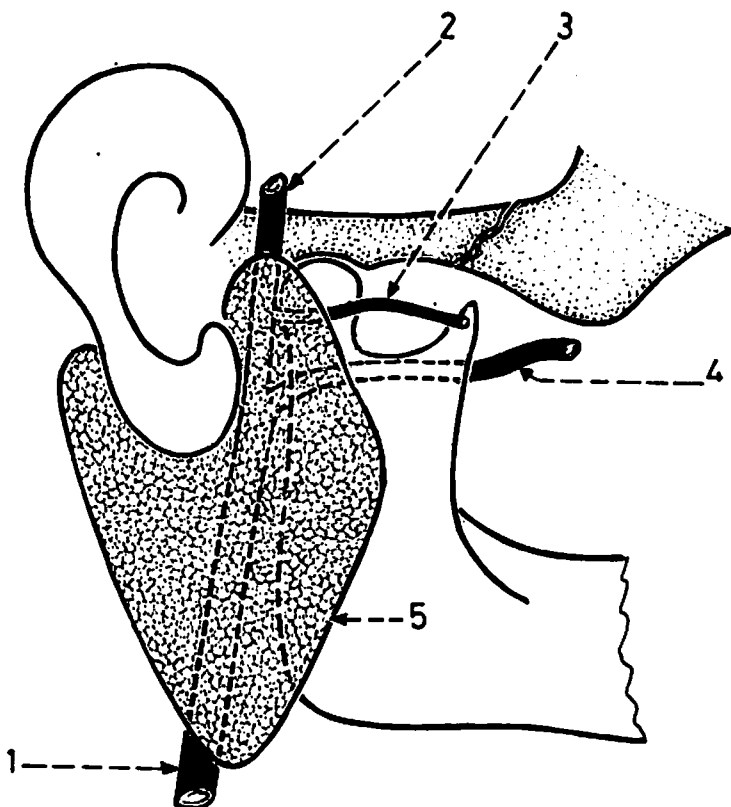


Fig.(441): SUPERFICIAL RELATIONS  
OF EXTERNAL CAROTID

It is crossed by posterior belly of digastric and stylohyoid muscles. Below the digastric it is crossed by the hypoglossal nerve and 2 veins (common facial and lingual). Above the digastric it lies deep to the retromandibular vein and facial nerve within the parotid gland.

1. retromandibular vein.
2. facial nerve.
3. posterior belly of digastric.
4. hypoglossal nerve.
5. common facial vein.
6. lingual vein.

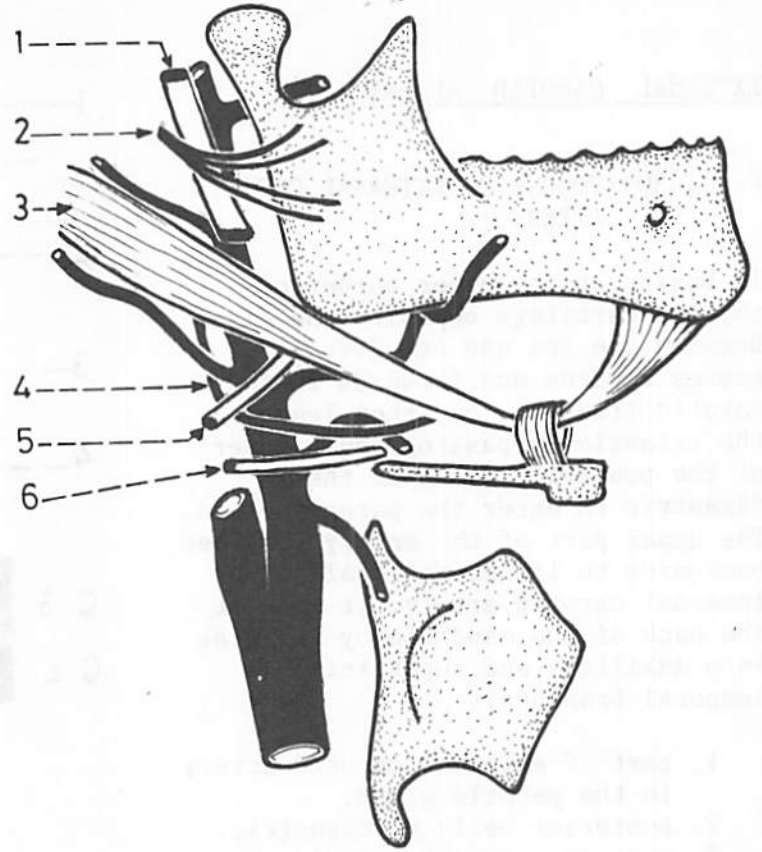


Fig.(442): DEEP RELATIONS  
OF EXTERNAL CAROTID

These are 3 nerves (superior laryngeal, pharyngeal branch of vagus and glossopharyngeal), 2 muscles (stylopharyngeus and styloglossus) in addition to the styloid process and part of the parotid gland.

1. styloid process.
2. vagus nerve.
3. superior laryngeal nerve.
4. deep part of parotid gland.
5. styloglossus muscle.
6. glossopharyngeal nerve.
7. stylopharyngeus muscle.
8. pharyngeal branch of vagus.
9. external carotid artery.

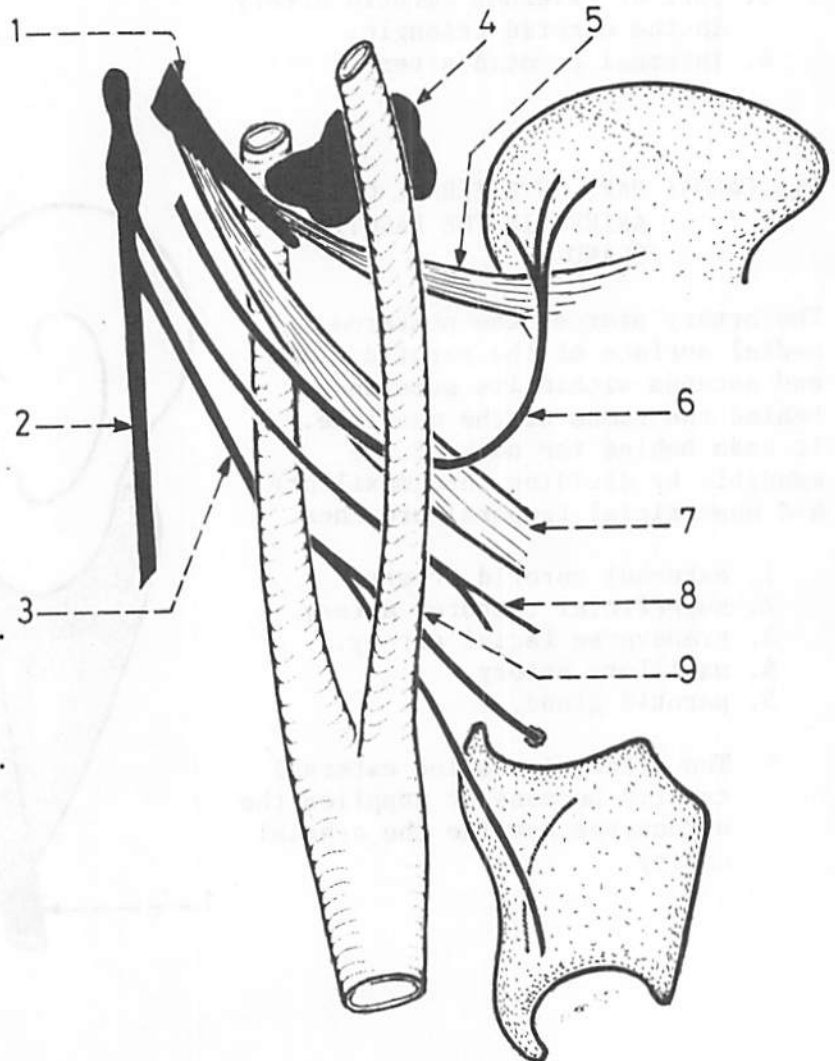


Fig.(443): BRANCHES OF EXTERNAL CAROTID ARTERY

These are the superior thyroid, lingual and facial (from its anterior aspect), occipital and posterior auricular (from its posterior aspect), ascending pharyngeal (from its medial aspect) and superficial temporal and maxillary (terminal divisions).

1. maxillary artery.
2. superficial temporal artery.
3. posterior auricular artery.
4. occipital artery.
5. ascending pharyngeal artery.
6. internal carotid artery.
7. common carotid artery.
8. facial artery.
9. lingual artery.
10. superior thyroid artery.
11. external carotid artery.

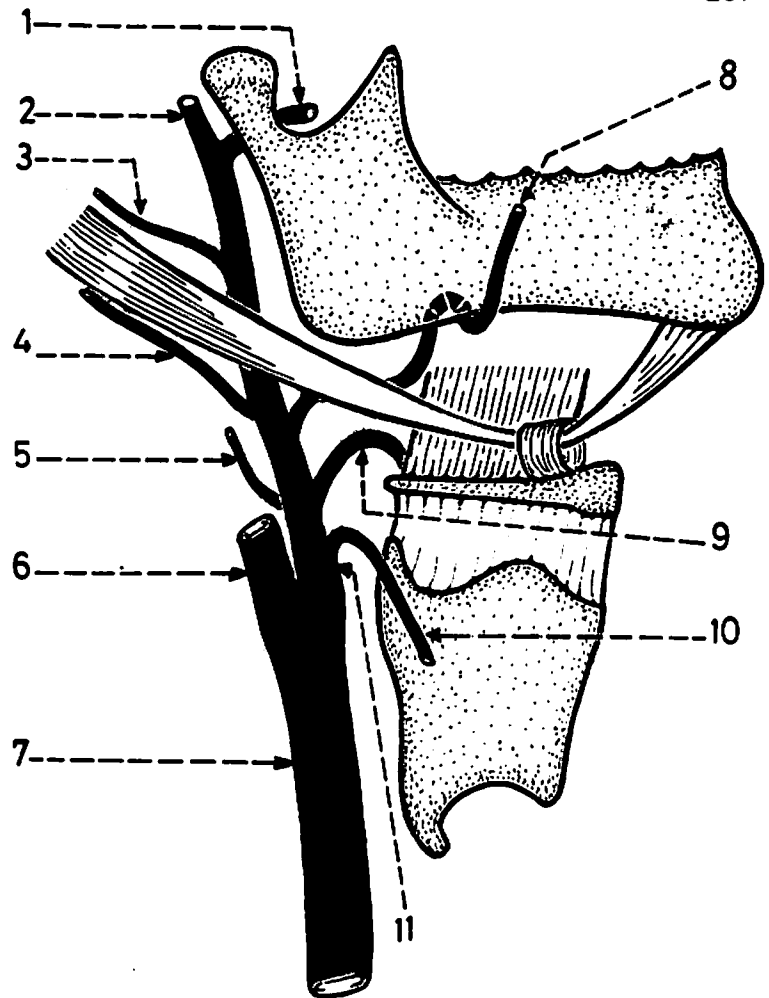


Fig.(444): SUPERIOR THYROID ARTERY

It is the lowest branch to arise from the front of the external carotid artery, just below the greater horn of the hyoid bone. It runs downwards and forwards to the apex of thyroid gland just in front of the external laryngeal nerve.

1. superior laryngeal nerve.
2. external laryngeal nerve (accompanies the superior thyroid artery).
3. posterior branch of superior thyroid artery (behind the lobe of thyroid gland).
4. inferior thyroid artery.
5. internal laryngeal nerve.
6. thyrohyoid membrane.
7. superior laryngeal artery.
8. superior thyroid artery.
9. anterior branch of superior thyroid artery.

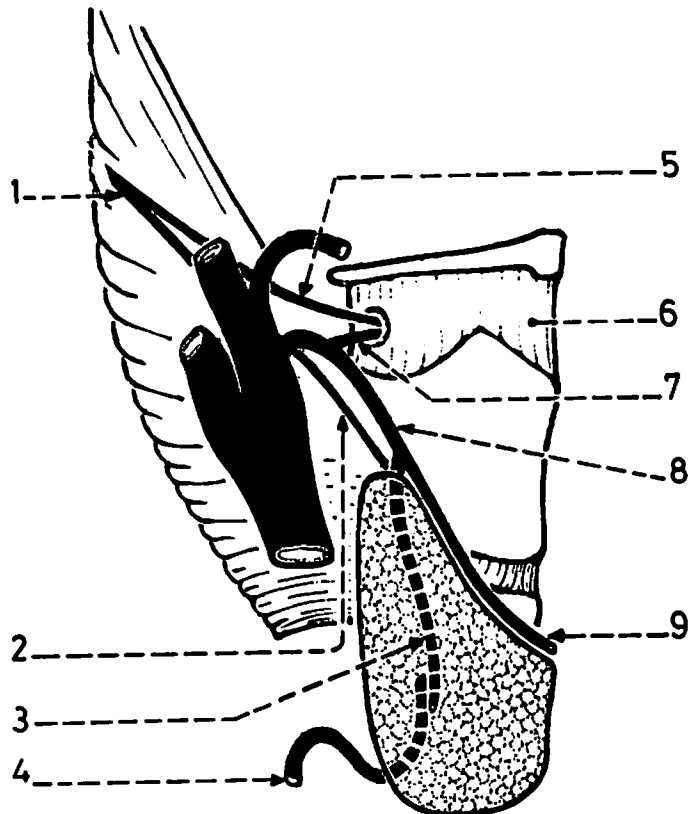


Fig.(445): BRANCHES OF SUPERIOR THYROID ARTERY

These are the infrahyoid, superior laryngeal, cricothyroid, sternomastoid and 2 glandular branches (anterior and posterior).

1. superior thyroid artery.
2. sternomastoid branch (to the sternomastoid muscle).
3. infrahyoid artery (along the lower border of the hyoid bone).
4. superior laryngeal artery (pierces the thyrohyoid membrane to enter the larynx).
5. cricothyroid artery (runs across the cricothyroid ligament).
6. anterior glandular branch (runs along the medial border of the upper pole of thyroid gland).
7. posterior glandular branch (descends on the back of thyroid gland).

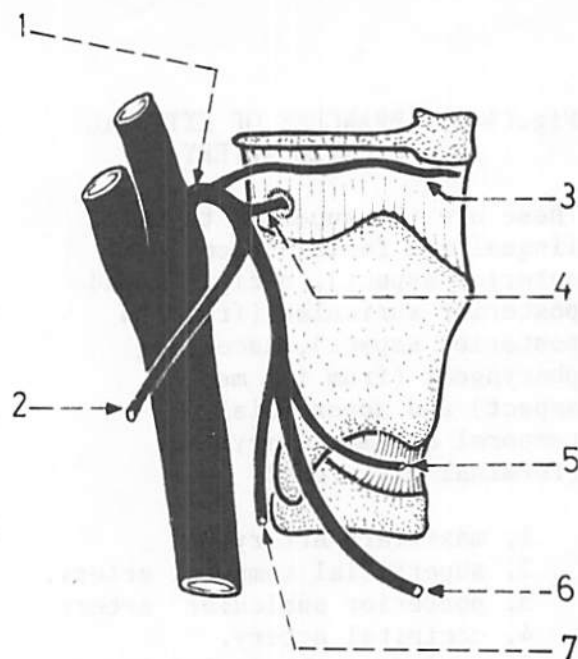
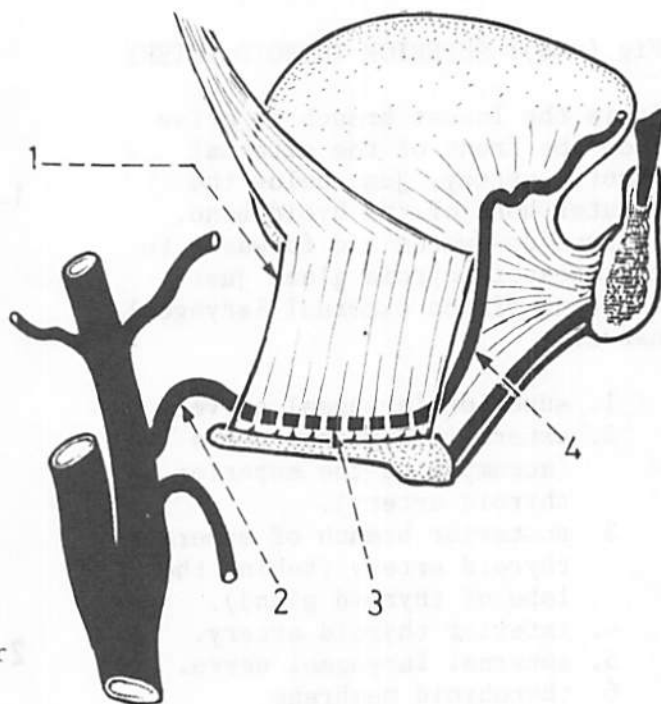


Fig.(446): COURSE OF LINGUAL ARTERY

It arises from the anterior aspect of external carotid artery opposite the tip of the greater horn of hyoid bone, just above the superior thyroid artery. It runs forwards deep to the hyoglossus muscle above the greater horn of the hyoid bone to reach the tongue.

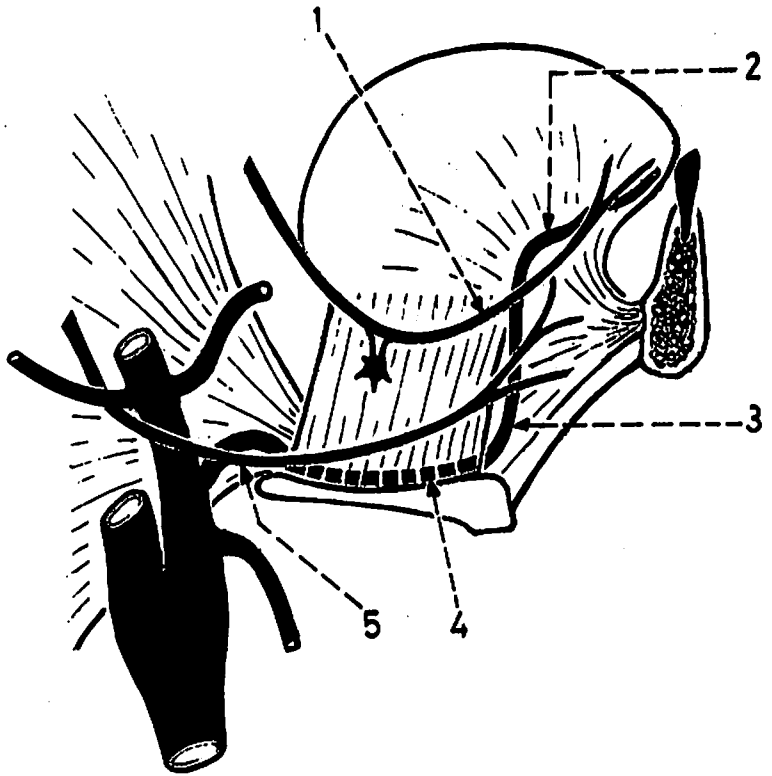
1. hyoglossus muscle.
2. 1st part of lingual artery (forms a loop around the tip of the greater horn of hyoid bone).
3. 2nd part of lingual artery (deep to the hyoglossus muscle).
4. 3rd part of lingual artery (runs vertically parallel to the anterior border of hyoglossus to reach the under surface of the tongue).



\* The lingual artery is divided by the hyoglossus into 3 parts: the 1st part proximal to the muscle, the 2nd part deep to the muscle while the 3rd part is distal to the muscle.

Fig.(447): RELATIONS OF LINGUAL ARTERY

The 1st part of the artery lies on the middle constrictor of the pharynx and is crossed by the hypoglossal nerve. The 2nd part lies deep to the hyoglossus between it and the middle constrictor. The 3rd part is crossed by the terminal branches of the hypoglossal nerve, and its part on the under surface of the tongue is accompanied by the lingual nerve close to the frenulum linguae.

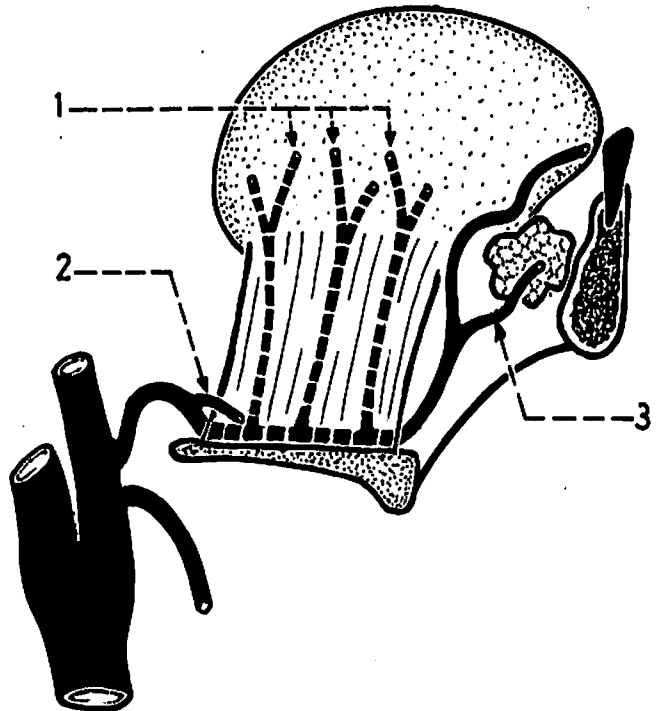


1. lingual nerve.
2. 3rd part of lingual artery on the under surface of the tongue.
3. 3rd part of the artery along the anterior border of the hyoglossus muscle.
4. 2nd part of lingual artery.
5. hypoglossal nerve crossing over the loop of the artery.

\* The lingual artery is related to 2 nerves: hypoglossal and lingual.

Fig.(448): BRANCHES OF LINGUAL ARTERY

These are the suprahyoid branch from the 1st part, the dorsal lingual branches from the 2nd part and the sublingual branch from the 3rd part.



1. dorsal lingual branches (ascend deep to the hyoglossus to reach the dorsum of the tongue).
2. suprahyoid artery (runs along the upper border of hyoid bone, superficial to the hyoglossus).
3. sublingual branch to the sublingual gland.

Fig.(449): COURSE OF FACIAL ARTERY

It arises from the front of the external carotid artery just above the lingual artery (may arise by a common trunk). It ascends deep to the posterior belly of digastric to enter the digastric triangle where it is related to the submandibular salivary gland. It curves around the lower border of the mandible at the anterior-inferior angle of the masseter to enter the face. It ends at the medial angle of the eye where it is called the angular artery.

1. posterior belly of digastric muscle.
2. facial artery in the carotid triangle.
3. facial artery deep to the mandible.
4. facial artery close to the angle of the mouth.
5. angular artery.
6. facial artery curving round the lower border of the mandible.

\* The facial artery has 2 parts:  
part in the neck and part in the face.

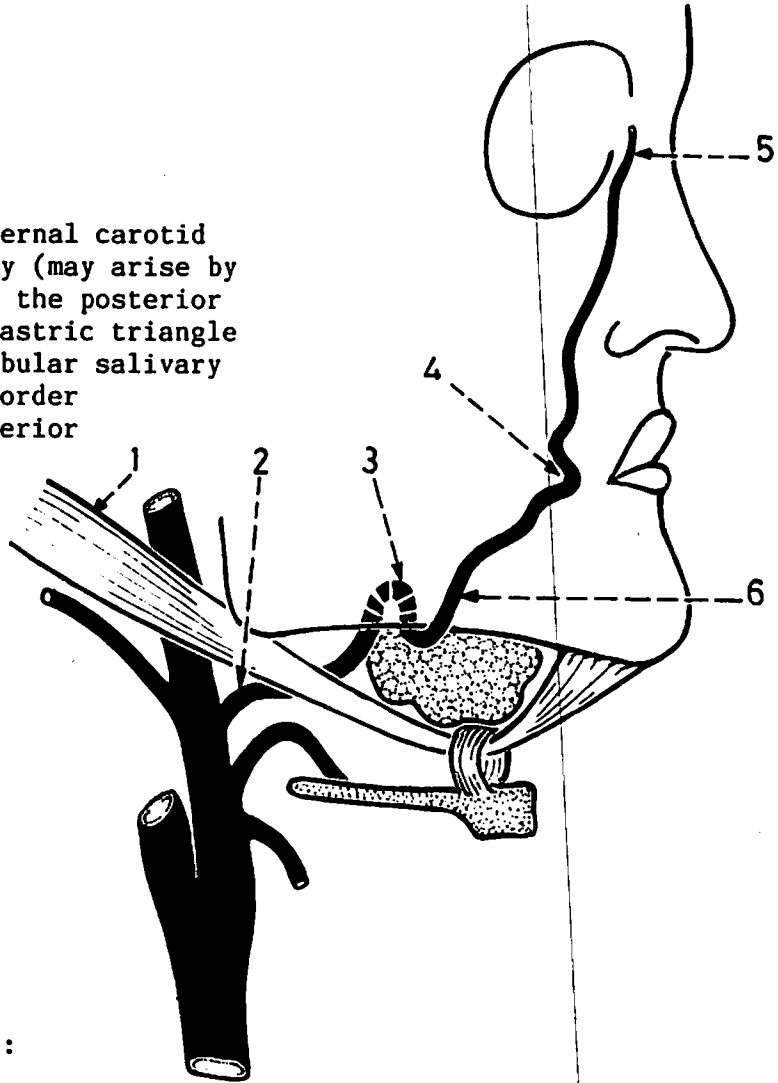


Fig.(450): BRANCHES OF THE FACIAL ARTERY IN THE NECK

These are the ascending palatine, tonsillar, glandular and submental branches.

1. ascending palatine branch (arches over the upper border of superior constrictor to reach the soft palate).
2. tonsillar branch (pierces the superior constrictor to reach the tonsil).
3. submental artery (runs forwards on the mylohyoid muscle just below the mandible).
4. glandular branches to the submandibular gland.
5. middle constrictor muscle of the pharynx.
6. superior constrictor muscle of the pharynx.

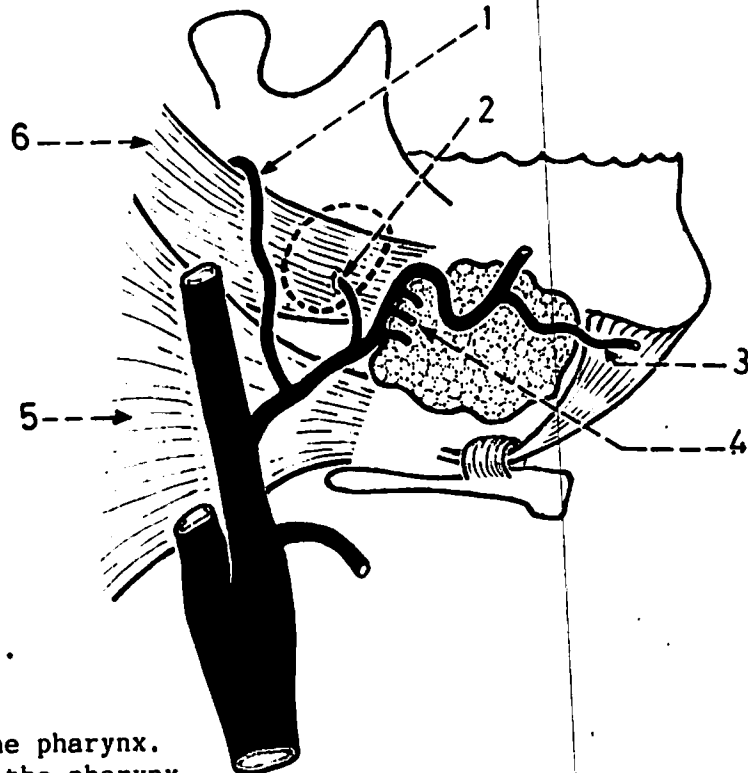




Fig.(451): BRANCHES OF THE FACIAL ARTERY IN THE FACE

These are the inferior labial, superior labial, lateral nasal and angular.

1. levator anguli oris.
2. facial vein (behind the artery).
3. buccinator muscle.
4. masseter muscle.
5. angular artery (at the medial angle of the eye).
6. lateral nasal artery (to the side of the nose).
7. superior labial artery (to the upper lip and gives off a septal branch to the nasal septum).
8. inferior labial artery (to the lower lip).
9. facial artery as it enters the face at the anterior-inferior angle of masseter.

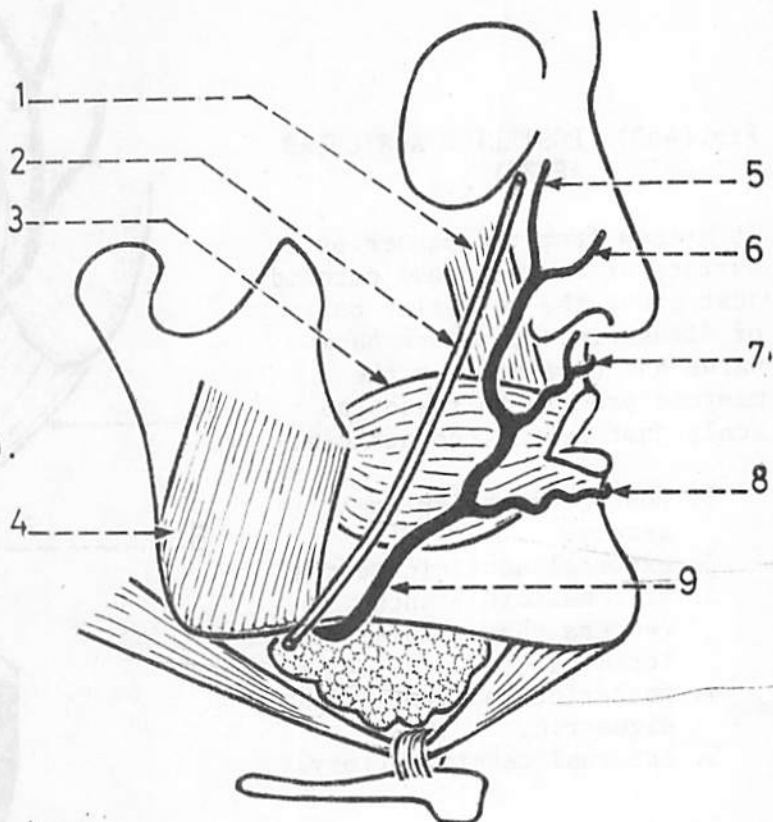


Fig.(452): COURSE AND BRANCHES OF OCCIPITAL ARTERY

It arises from the posterior aspect of external carotid opposite the facial artery. It runs upwards and backwards deep to the posterior belly of digastric and mastoid process to enter the back of the scalp.

1. greater occipital nerve (accompanies the termination of the artery).
2. descending branch.
3. posterior belly of digastric.
4. occipital artery.
5. sternomastoid branches.
6. hypoglossal nerve winding round the beginning of the artery.
7. occipital artery in the scalp.
8. mastoid branch (enters mastoid foramen).
9. occipital artery deep to the mastoid process.

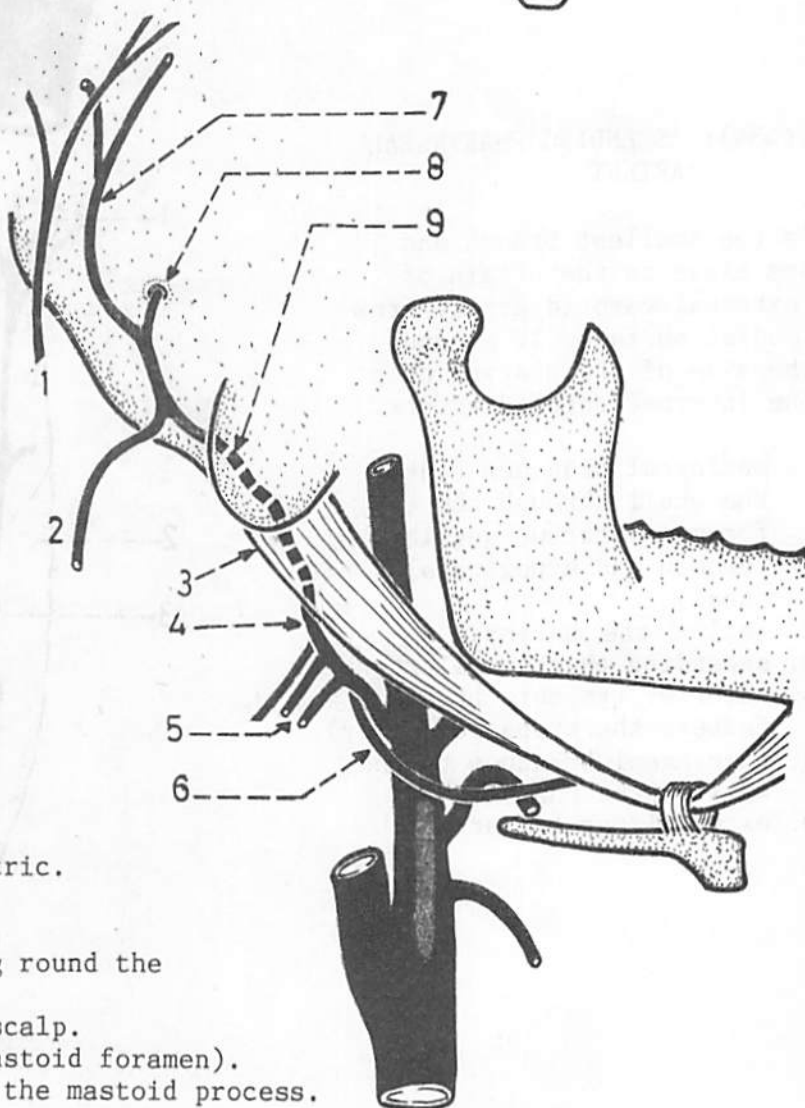


Fig.(453): POSTERIOR AURICULAR ARTERY

It arises from the posterior surface of the external carotid just above the posterior belly of digastric. It passes backwards and upwards over the mastoid process to reach the scalp just behind the auricle.

1. posterior auricular artery.
2. external acoustic meatus.
3. stylomastoid branch (enters the stylomastoid foramen).
4. posterior belly of digastric.
5. external carotid artery.

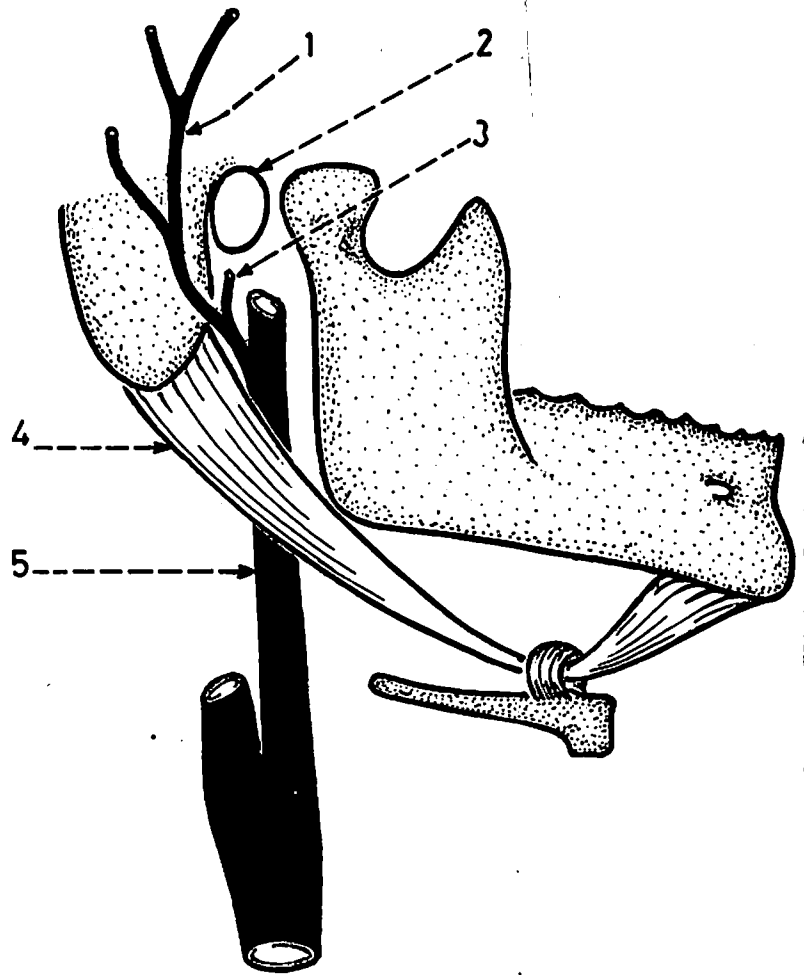


Fig.(454): ASCENDING PHARYNGEAL ARTERY

It is the smallest branch and arises close to the origin of the external carotid artery from its medial surface. It ascends on the side of the pharynx deep to the internal carotid artery.

1. meningeal branches (enter the skull through the foramen lacerum, jugular foramen and hypoglossal canal).
2. wall of the pharynx.
3. ascending pharyngeal artery.
4. inferior tympanic branch (enters the tympanic cavity).
5. pharyngeal branches to the wall of the pharynx.
6. external carotid artery.

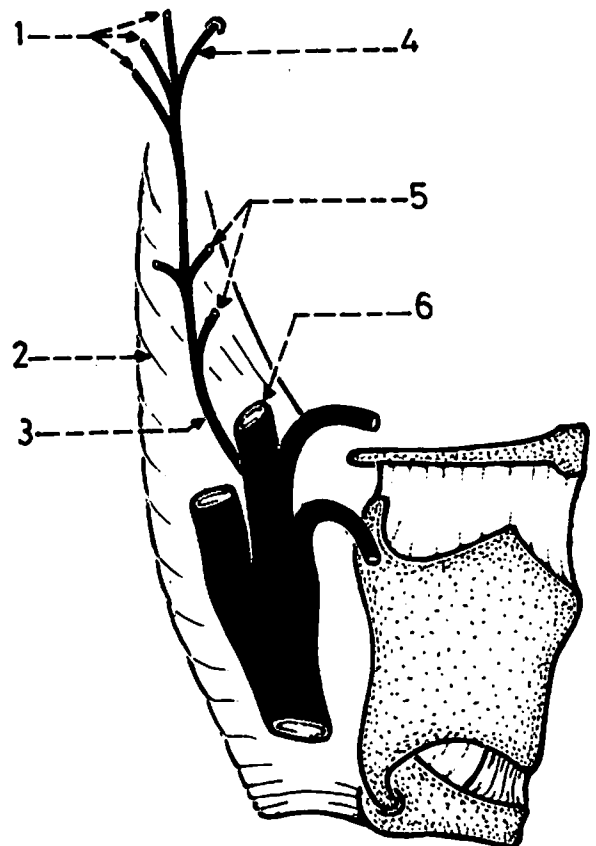
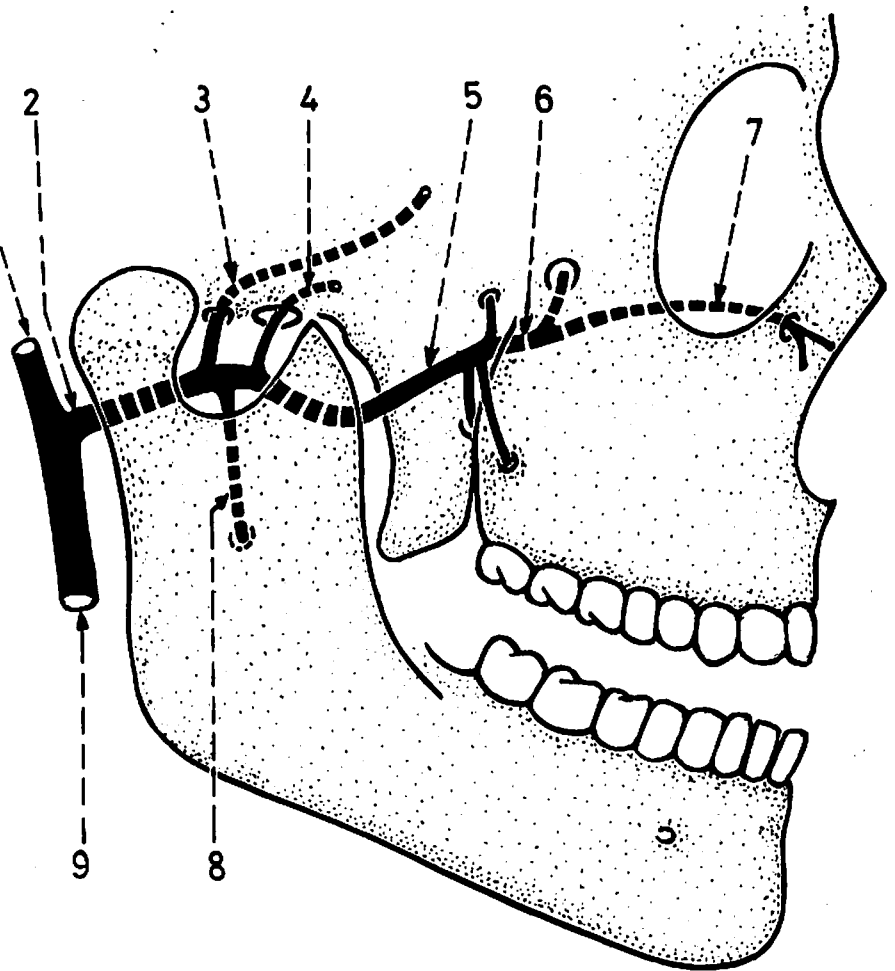


Fig.(455): MAXILLARY ARTERY

It is the larger terminal branch of the external carotid artery which arises behind the neck of the mandible. It passes forwards deep to the neck of the mandible, traverses the infratemporal fossa and ends in the pterygopalatine fossa by dividing into terminal branches.

1. superficial temporal artery.
2. 1st part of maxillary artery.
3. middle meningeal artery.
4. accessory meningeal artery.
5. 2nd part of maxillary artery.
6. 3rd part of maxillary artery.
7. infraorbital artery.
8. inferior alveolar artery.
9. external carotid artery.

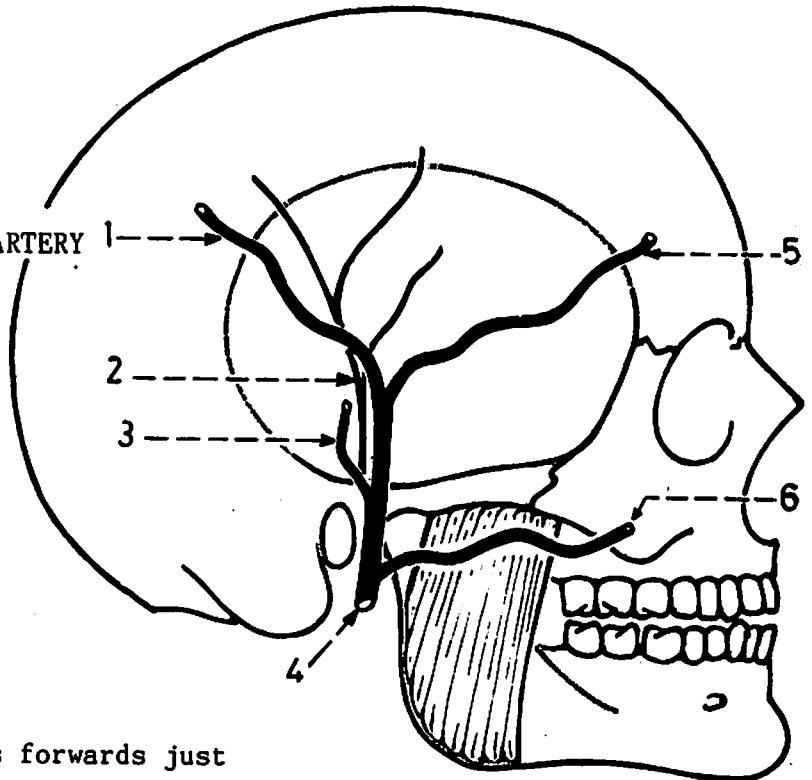


\* For more details on the maxillary artery see figs. 186, 187, 188.

Fig.(456): SUPERFICIAL TEMPORAL ARTERY

It is the smaller terminal branch of external carotid. It crosses over the posterior part of the zygomatic arch to enter the temporal fossa.

1. posterior terminal branch.
2. auriculotemporal nerve.
3. middle temporal artery (grooves the bone just above the external acoustic meatus).
4. superficial temporal artery.
5. anterior terminal branch.
6. transverse facial artery (runs forwards just below the zygomatic arch).



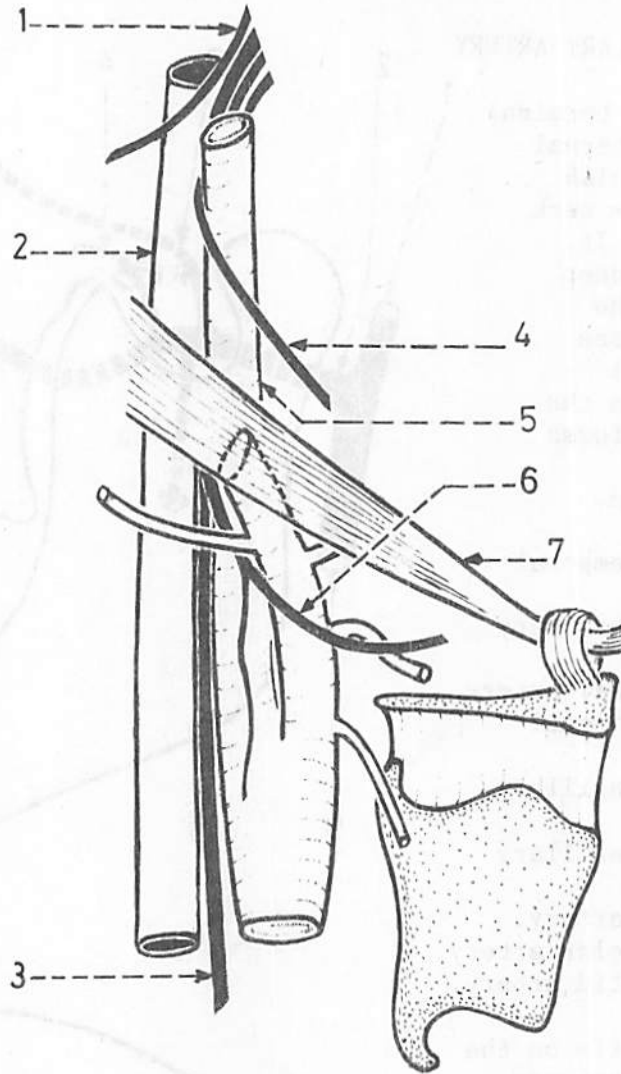
INTERNAL CAROTID ARTERY

Fig.(457): RELATIONS OF INTERNAL CAROTID ARTERY TO THE INTERNAL JUGULAR VEIN AND LOWER FOUR CRANIAL NERVES

At the base of the skull the internal jugular vein lies posterior to the internal carotid artery from which it is separated by the lower 4 cranial nerves (9,10,11,12). At the level of the posterior belly of digastric, the I.J.V. lies lateral to the I.C.A. with 2 nerves in between: the hypoglossal nerve in front and the vagus nerve behind. All through its course in the neck, the artery, the vein and the vagus nerve are surrounded by the carotid sheath.

1. accessory nerve (passes downwards and backwards in front of the I.J.V.).
2. internal jugular vein (lies lateral to the artery except at the base of the skull where it lies behind it).
3. vagus nerve (descends vertically between the artery and the vein).
4. glossopharyngeal nerve (passes downwards and forwards in front of the artery).
5. internal carotid artery.
6. hypoglossal nerve (passes forwards superficial to the internal and external carotids as well as the loop of the lingual artery).
7. posterior belly of digastric.

Fig.(459): SUPERFICIAL RELATIONS OF  
INTERNAL CAROTID ARTERY

These are muscles (posterior belly of digastric, stylohyoid, stylopharyngeus and styloglossus), arteries (external carotid, occipital and posterior auricular), veins (lingual and common facial), nerves (glossopharyngeal, pharyngeal branch of vagus, hypoglossal and the descendens hypoglossi) and deep part of parotid gland.

1. posterior auricular artery.
2. posterior belly of digastric.
3. occipital artery.
4. hypoglossal nerve.
5. descendens hypoglossi.
6. part of the parotid gland.
7. styloglossus muscle.
8. glossopharyngeal nerve.
9. stylopharyngeus muscle.
10. external carotid artery.
11. stylohyoid muscle.
12. internal carotid artery.

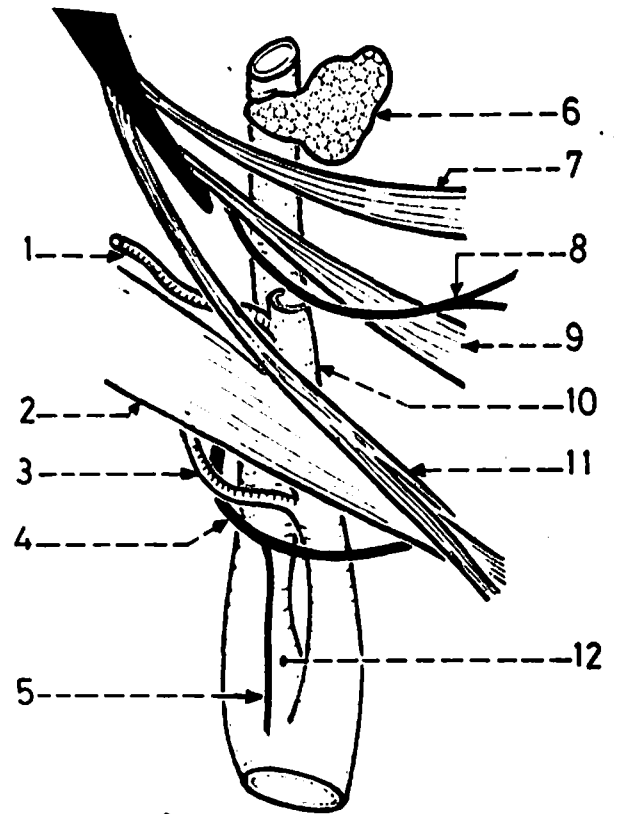


Fig.(460): DEEP RELATIONS OF  
INTERNAL CAROTID ARTERY

These are mainly the superior cervical sympathetic ganglion and the superior laryngeal branch of vagus.

1. internal carotid nerve (upward continuation of the sympathetic trunk).
2. superior cervical sympathetic ganglion.
3. superior laryngeal nerve (divides into internal and external laryngeal branches).
4. internal carotid artery.
5. sympathetic trunk.
6. internal laryngeal nerve.
7. external laryngeal nerve.

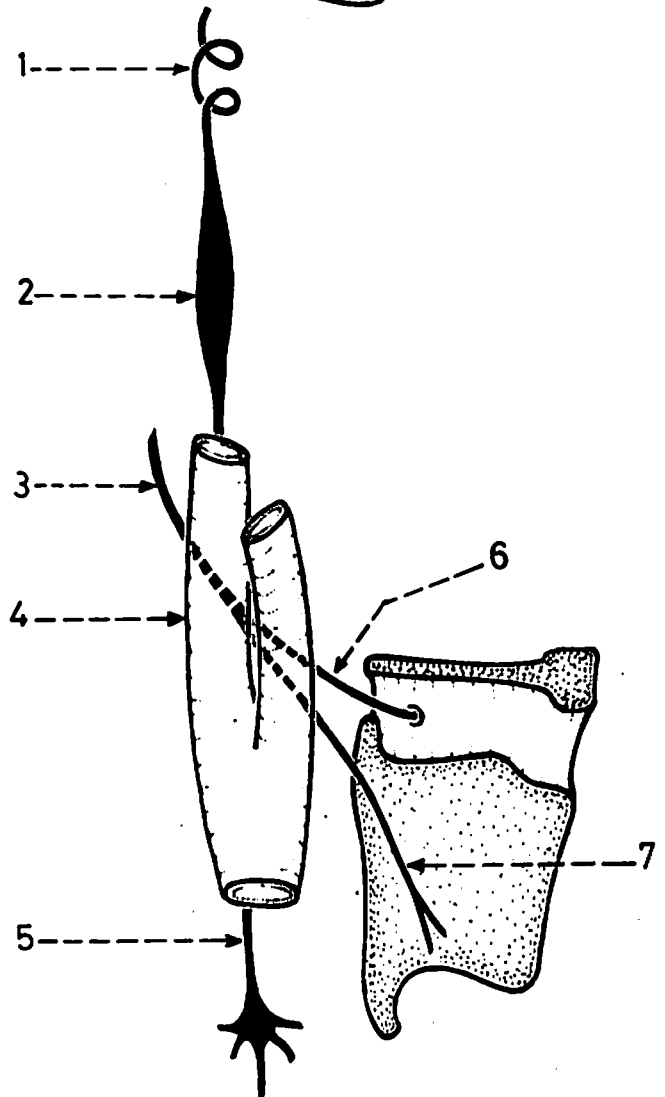


Fig.(461): THE INTERNAL CAROTID ARTERY IN THE CAROTID CANAL

The artery passes through the carotid canal in the petrous part of the temporal bone.

1. carotico-tympanic branch (to the middle ear).
2. trigeminal ganglion.
3. the artery surrounded by a plexus of sympathetic fibres.
4. internal jugular vein.

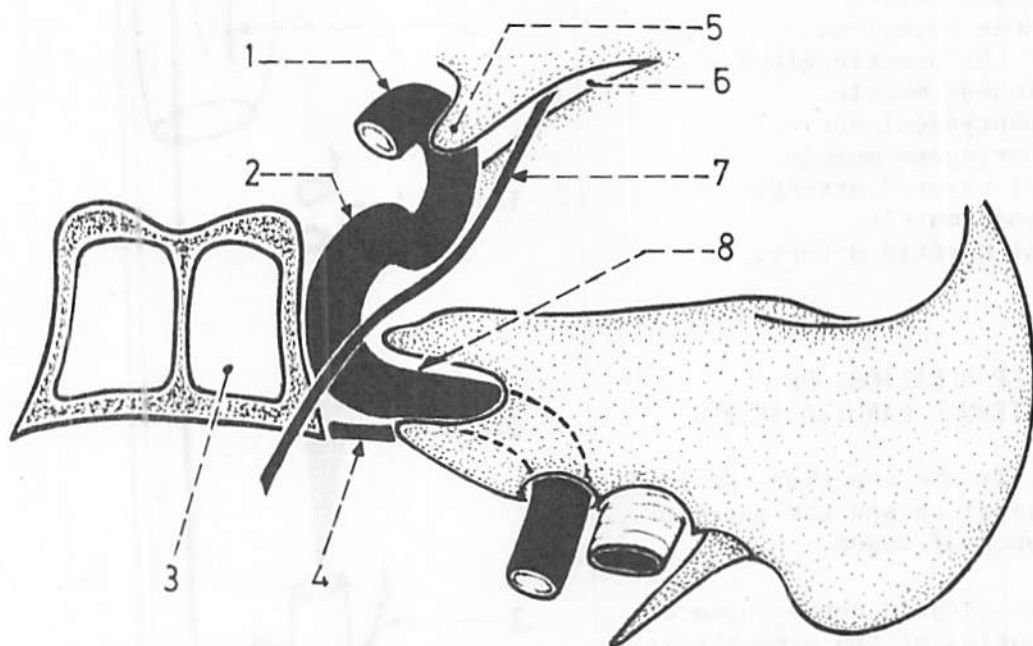
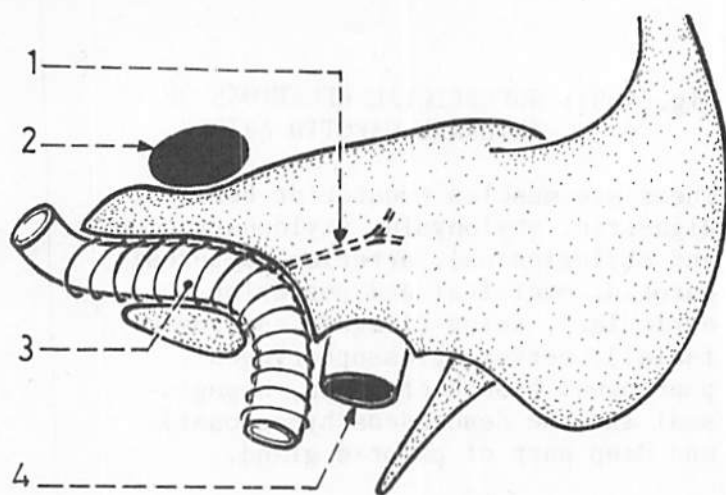


Fig.(462): THE INTERNAL CAROTID ARTERY IN THE CAVERNOUS SINUS

In the cavernous sinus the artery has a sinuous course. It runs at first upwards then forwards on the side of the body of sphenoid, then upwards again to pierce the roof of the sinus then curves backwards above the sinus where it ends.

1. terminal part of I.C.A. (curves backwards above the sinus).
2. I.C.A. within the cavernous sinus (directed forwards).
3. sphenoidal air sinus within the body of sphenoid.
4. plate of cartilage closing the floor of foramen lacerum.
5. anterior clinoid process (just lateral to the artery as it leaves the sinus).
6. superior orbital fissure.
7. abducent nerve (runs forwards in the sinus lateral to the artery).
8. I.C.A. as it leaves the carotid canal and traverses the foramen lacerum above its floor to enter the cavernous sinus.

Fig.(463): OPHTHALMIC AND HYPOPHYSEAL BRANCHES OF INTERNAL CAROTID

The ophthalmic artery arises from the I.C.A. just after piercing the roof of the sinus, while the hypophyseal arteries arise inside the sinus.

1. optic canal.
2. ophthalmic artery.
3. internal carotid artery as it leaves the sinus.
4. cavernous sinus.
5. hypophyseal branches to the hypophysis cerebri.
6. abducent nerve.
7. internal carotid artery in the sinus.

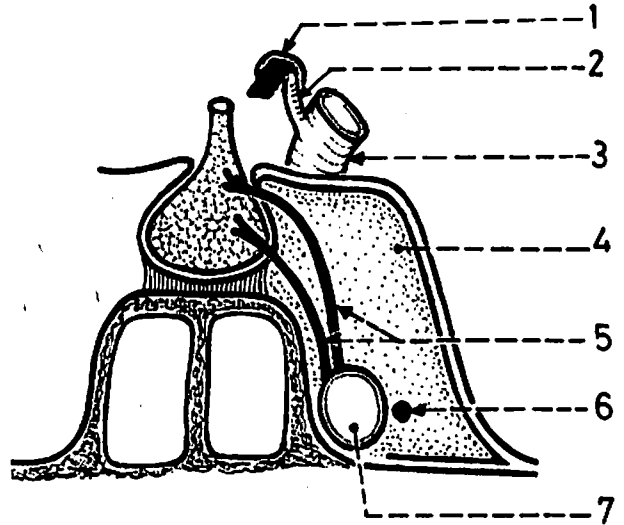


Fig.(464): TERMINATION OF INTERNAL CAROTID ARTERY

The artery ends just below the anterior perforated substance of the brain and lateral to the optic chiasma by giving off 4 branches (anterior cerebral, middle cerebral, posterior communicating and anterior choroidal).

1. optic chiasma.
2. optic nerve.
3. anterior cerebral artery.
4. middle cerebral artery.
5. termination of internal carotid.
6. anterior choroidal artery.
7. posterior communicating artery (joins the posterior cerebral artery to complete the circle of Willis).
8. optic tract.
9. posterior cerebral artery.

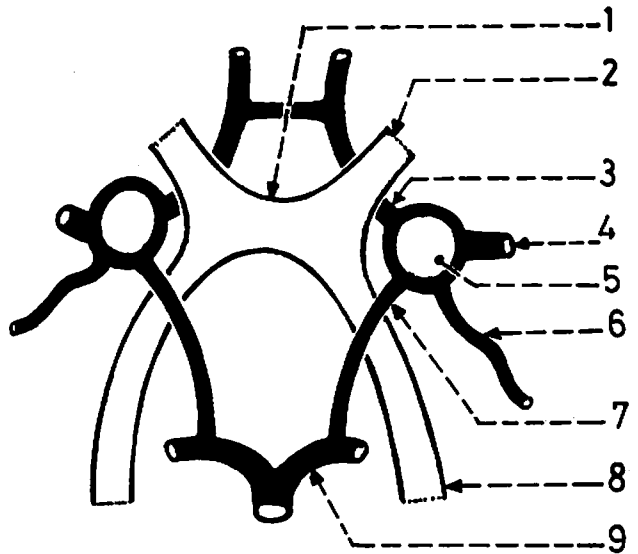


Fig.(465): THE INTERNAL CAROTID ARTERY TRAVERSING THE FORAMEN LACERUM

1. roof of foramen lacerum (open).
2. internal carotid artery passing through the foramen above its floor.
3. floor of the foramen closed by cartilage.

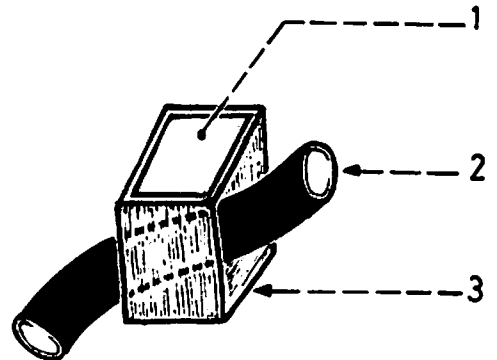


Fig.(466): COLLATERAL CIRCULATION  
IN LIGATION OF THE EXTERNAL  
CAROTID ARTERY

In case the external carotid artery of one side is ligated or obstructed, the collateral circulation is established through the following anastomoses:

1. anastomosis between branches of the external and internal carotid arteries of the same side, in the face and scalp.
2. anastomosis between branches of the right and left external carotid arteries.
3. anastomosis between the superior and inferior thyroid arteries.
4. anastomosis between the occipital and deep cervical arteries in the back of the neck.

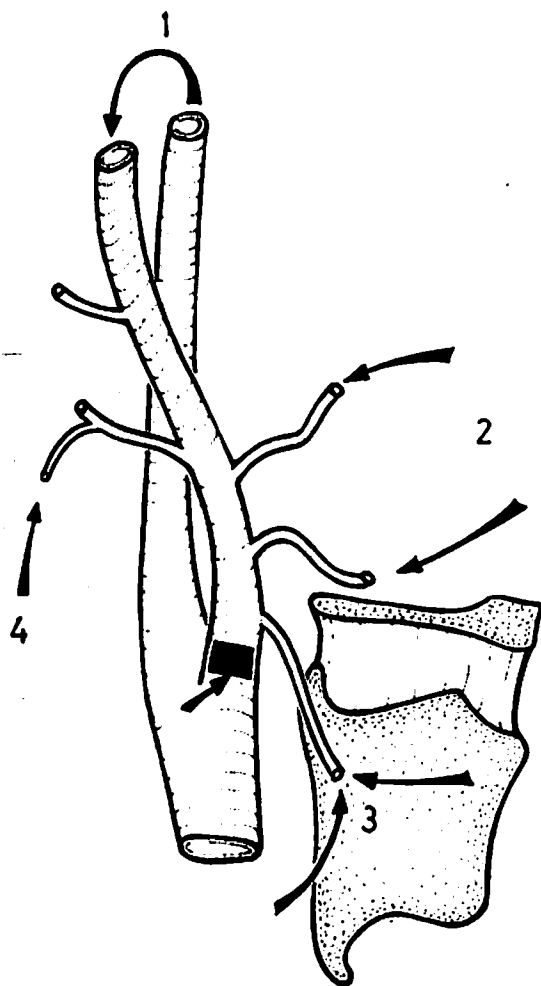
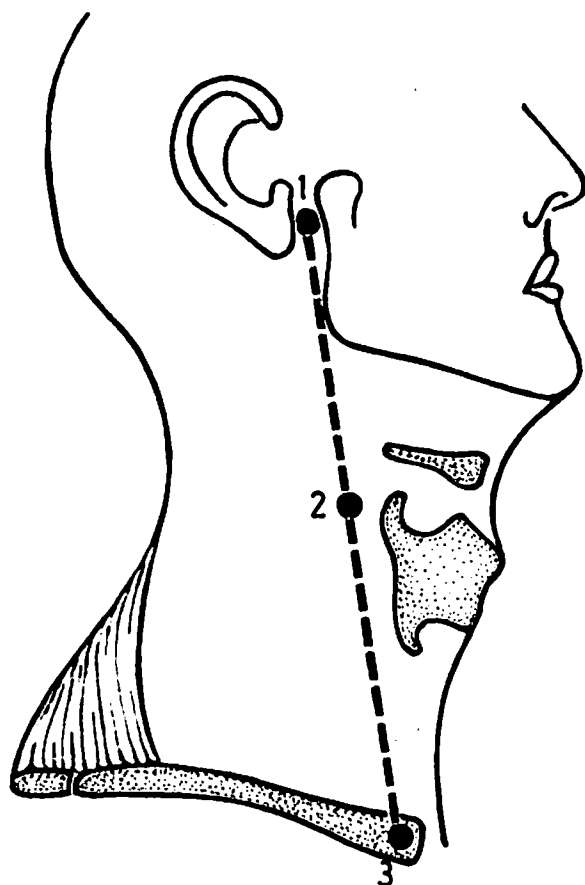


Fig.(467): SURFACE ANATOMY OF THE  
INTERNAL AND COMMON  
CAROTID ARTERY

These 2 arteries are represented by a line drawn from a point just behind the neck of the mandible (point 1) to the sternoclavicular joint (point 3). The junction between the 2 arteries is represented by a point opposite the upper border of thyroid cartilage (point 2). The internal carotid artery corresponds to the part of the line between point (1) and point (2), while the common carotid artery corresponds to the part of the line between point (2) and point (3).





## SUBCLAVIAN ARTERY

Fig.(468): ORIGIN AND PARTS OF THE SUBCLAVIAN ARTERY

The right subclavian arises from the brachiocephalic artery behind the sternoclavicular joint while the left subclavian arises directly from the arch of the aorta. The subclavian artery is divided by the scalenus anterior into 3 parts.

1. right subclavian artery.
2. right common carotid artery.
3. left common carotid artery.
4. scalenus anterior muscle.
5. 3rd part of subclavian artery.
6. 2nd part of subclavian artery (behind the muscle).
7. 1st part of subclavian artery.
8. arch of aorta.
9. brachiocephalic artery.

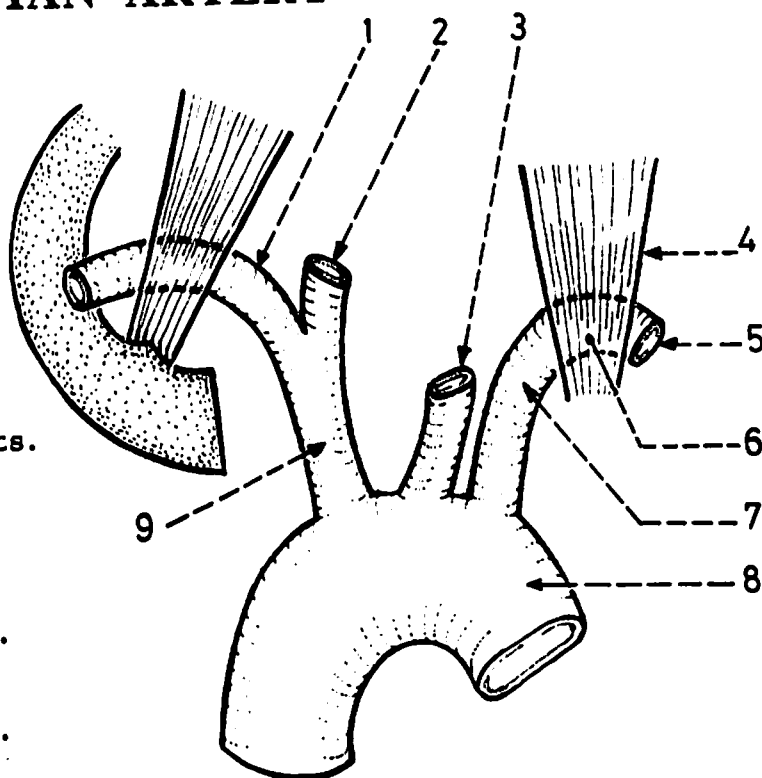


Fig.(469): ANTERIOR RELATIONS OF 1st AND 2nd PARTS OF RIGHT SUBCLAVIAN ARTERY

The 1st part is related to 2 nerves (vagus and ansa subclavia), 2 veins (internal jugular and vertebral) and 2 muscles (sternothyroid and sternohyoid). 2 nerves wind round the 1st part: right recurrent laryngeal nerve and ansa subclavia).

The 2nd part is related anteriorly to the scalenus anterior and right phrenic nerve.

1. right phrenic nerve.
2. inferior cervical ganglion.
3. scalenus anterior.
4. middle cervical ganglion.
5. ansa subclavia.
6. right recurrent laryngeal nerve.
7. right common carotid artery.
8. right vagus nerve.
9. internal jugular vein.

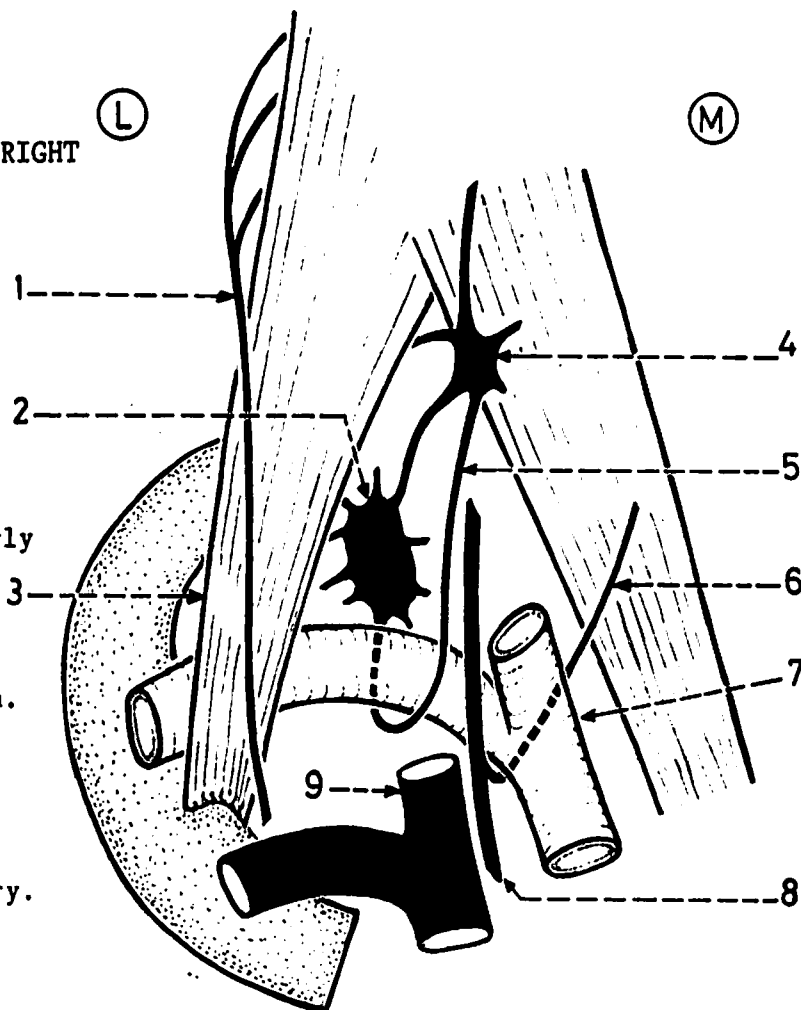


Fig.(470): RELATIONS SPECIFIC TO  
1st PART OF LEFT  
SUBCLAVIAN ARTERY

These are the thoracic duct and left phrenic nerve which cross in front of the artery near the scalenus anterior.

1. longus colli muscle.
2. left common carotid.
3. left subclavian artery.
4. left innominate vein.
5. left phrenic nerve.
6. scalenus anterior.
7. thoracic duct.

\* The structure specific to the 1st part of right subclavian artery is the right recurrent laryngeal nerve which winds round the artery. (The artery is not directly related to the phrenic nerve.)

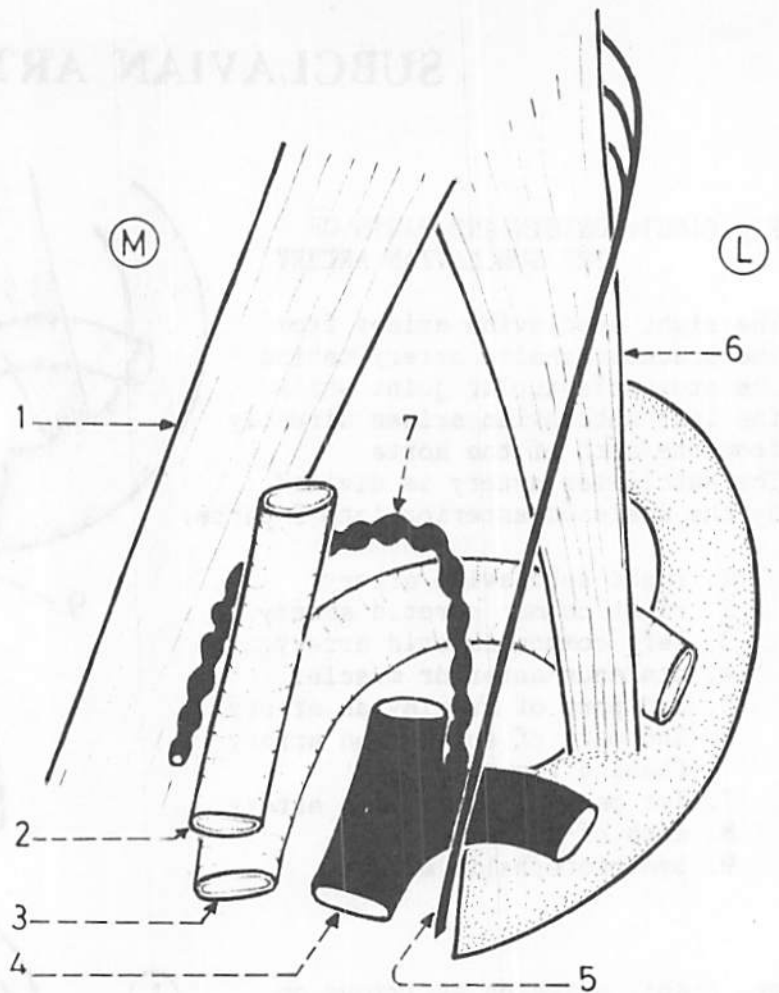


Fig.(471): STRUCTURES BEHIND THE  
1st PART OF SUBCLAVIAN  
ARTERY ON BOTH SIDES

These are the suprapleural membrane, cervical pleura and apex of the lung.

1. scalenus anterior.
2. longus colli.
3. transverse process of 7th cervical vertebra.
4. apex of the lung together with the covering cervical pleura.
5. 1st part of subclavian artery.
6. suprapleural membrane (extends from the tip of the transverse process of 7th cervical vertebra to the inner border of 1st rib, and separates the artery from the pleura and lung).

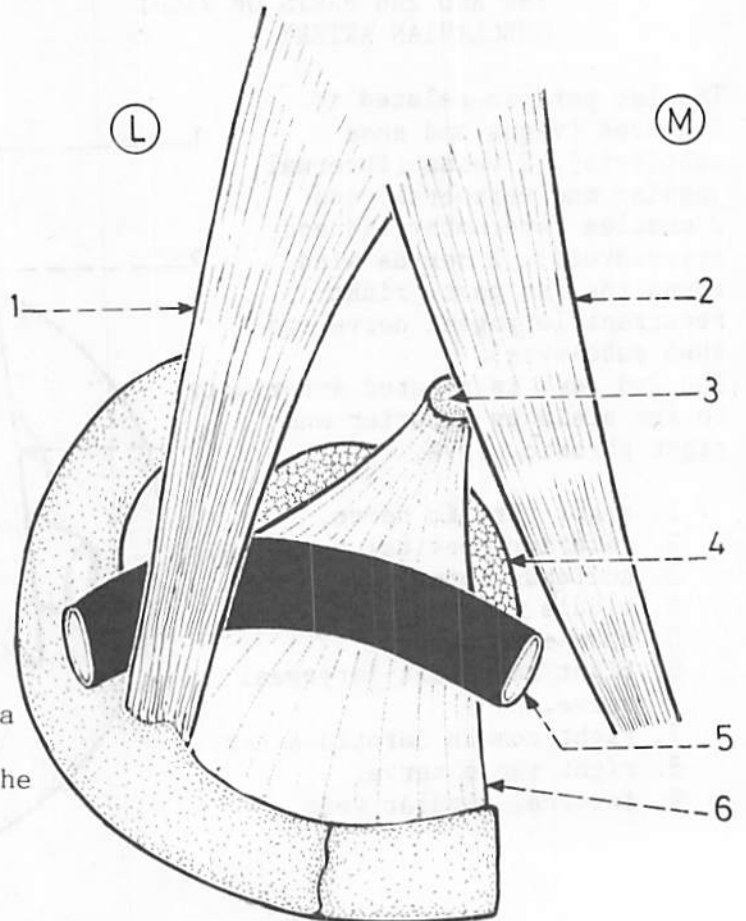


Fig.(472): BRANCHES OF 1st PART OF SUBCLAVIAN ARTERY

These are the thyrocervical trunk, vertebral artery and internal thoracic artery.

1. inferior thyroid artery.
2. transverse cervical artery.
3. suprascapular artery.
4. thyrocervical trunk (ascends along the medial border of the scalenus anterior and divides into suprascapular, transverse cervical and inferior thyroid arteries).
5. internal thoracic artery.
6. vertebral artery (runs upwards towards the apex of the triangular interval between the scalenus anterior and longus colli).
7. right common carotid artery.
8. 1st part of subclavian artery.

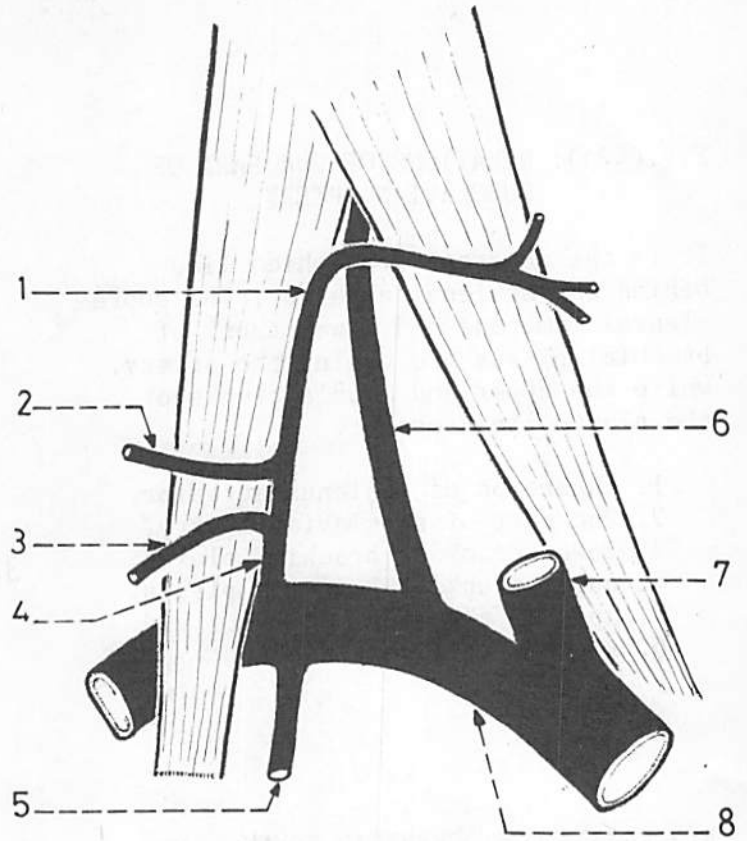


Fig.(473): THYROCERVICAL TRUNK

It is a short trunk which arises from the 1st part of subclavian artery close to the medial border of scalenus anterior. It divides into suprascapular, transverse cervical and inferior thyroid arteries.

1. ascending cervical artery (from the inferior thyroid).
2. inferior thyroid artery curving medially between the vertebral and common carotid arteries.
3. transverse cervical artery.
4. suprascapular artery.
5. thyrocervical trunk.
6. common carotid artery.
7. thyroid gland.
8. vertebral artery.
9. right recurrent laryngeal nerve winding round the subclavian artery.
10. right vagus nerve.
11. scalenus anterior muscle.

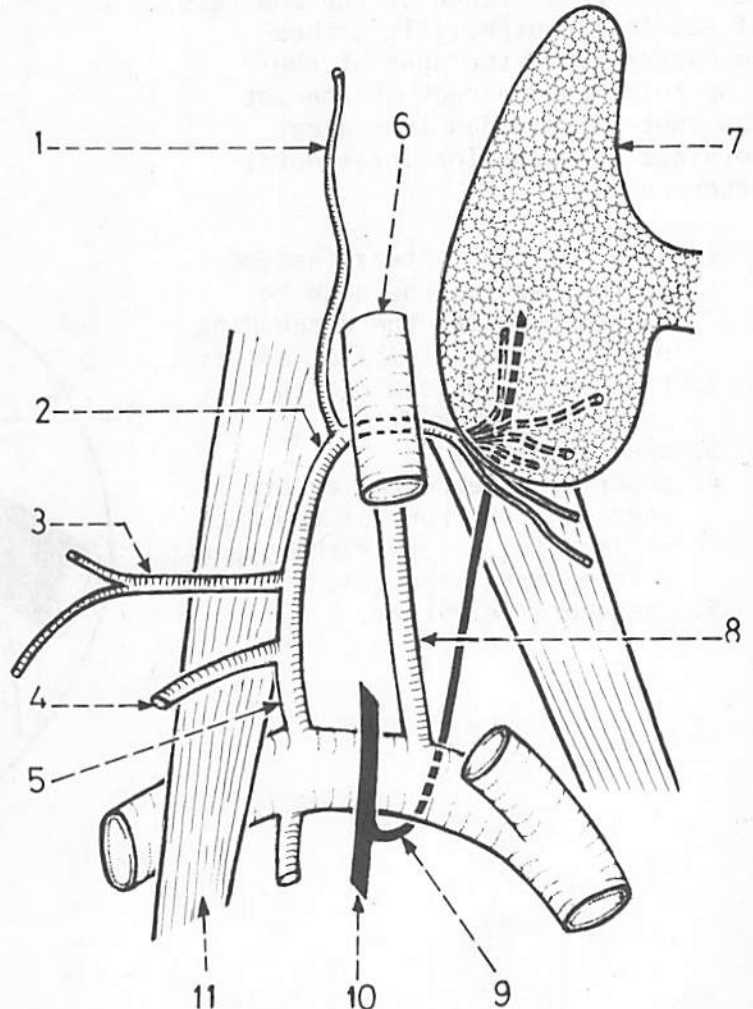


Fig.(474): RELATIONS OF 2nd PART OF SUBCLAVIAN ARTERY

It is the shortest part which lies behind the scalenus anterior. The supra-pleural membrane and lower trunk of brachial plexus lie behind the artery, while the upper and middle trunks of the plexus lie above it.

1. insertion of scalenus anterior.
2. 2nd part of subclavian artery.
3. lower trunk of brachial plexus.
4. upper trunk of brachial plexus.
5. apex of the lung.
6. supra-pleural membrane.

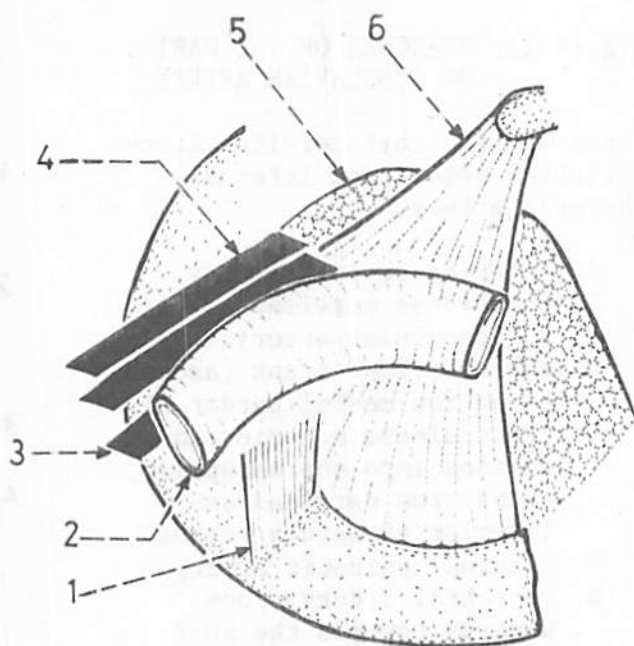


Fig.(475): COSTOCERVICAL TRUNK

It is the only branch of the 2nd part of subclavian artery. It arches backwards above the apex of the lung to reach the neck of the 1st rib where it divides into deep cervical and superior intercostal arteries.

1. deep cervical artery (ascends in the back of the neck to anastomose with the descending branch of the occipital artery).
2. transverse process of 7th cervical vertebra.
3. head of 1st rib.
4. superior intercostal artery (descends in front of the neck of 1st rib to supply the upper 2 intercostal spaces).
5. costocervical trunk.

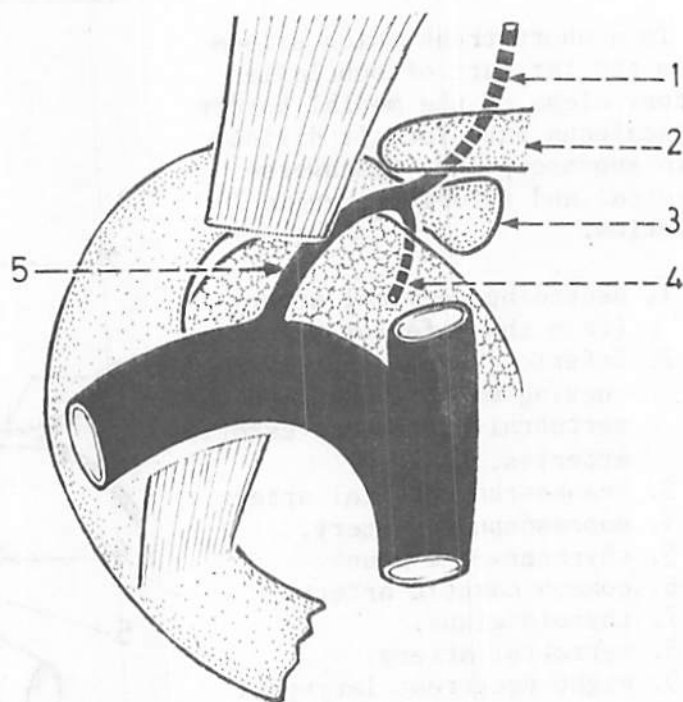
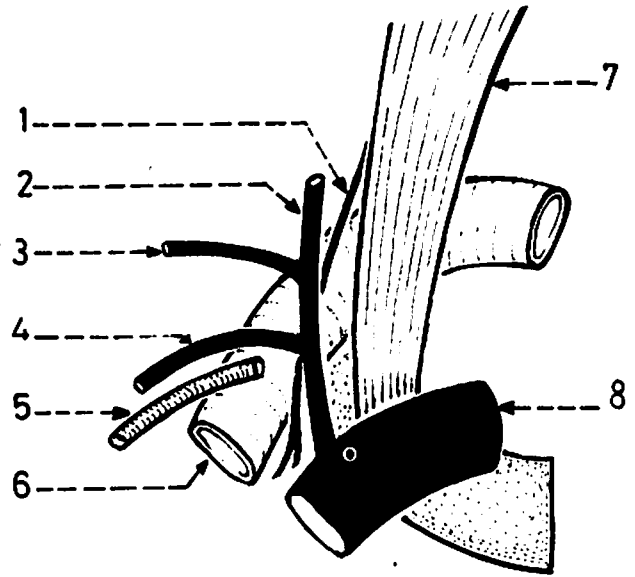


Fig.(476): 3rd PART OF SUBCLAVIAN ARTERY

It lies in the lower part of the posterior triangle and is related anteriorly to the external jugular vein, suprascapular vessels and nerve to subclavius.

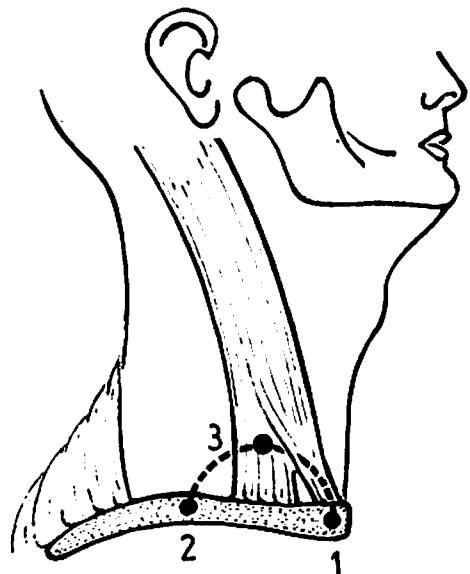


1. nerve to subclavius.
2. external jugular vein.
3. transverse cervical vein.
4. suprascapular vein.
5. suprascapular artery.
6. 3rd part of subclavian artery (continues in the axilla as the axillary artery).
7. scalenus anterior.
8. subclavian vein (separated from the subclavian artery by the insertion of the scalenus anterior).

Fig.(477): SURFACE ANATOMY OF SUBCLAVIAN ARTERY

It is represented by a curved line with its convexity upwards drawn from the sterno-clavicular joint (point 1) to the middle of the clavicle (point 2). The summit of the arch lies 3 cm above the clavicle (point 3).

\* Note that the 3rd part of subclavian artery is the most superficial part and can be felt pulsating on deep pressure at the anterior inferior angle of the posterior triangle.



## VERTEBRAL ARTERY

Fig.(478): COURSE AND PARTS OF VERTEBRAL ARTERY

It arises from the 1st part of subclavian artery in the root of the neck, and ends inside the skull by joining its fellow to form the basilar artery. Its course is divided into 4 parts.

1. 1st part: ascends in the interval between the scalenus anterior and longus colli.
2. 2nd part: runs in the foramina transversaria of cervical vertebrae from the 6th vertebra below to the 1st vertebra above.
3. 3rd part: lies in the suboccipital triangle, behind the lateral mass of the atlas vertebra.
4. 4th part: lies inside the cranial cavity (intracranial part).

\* The vertebral artery passes through the foramina transversaria of the upper 6 cervical vertebrae but not the 7th.

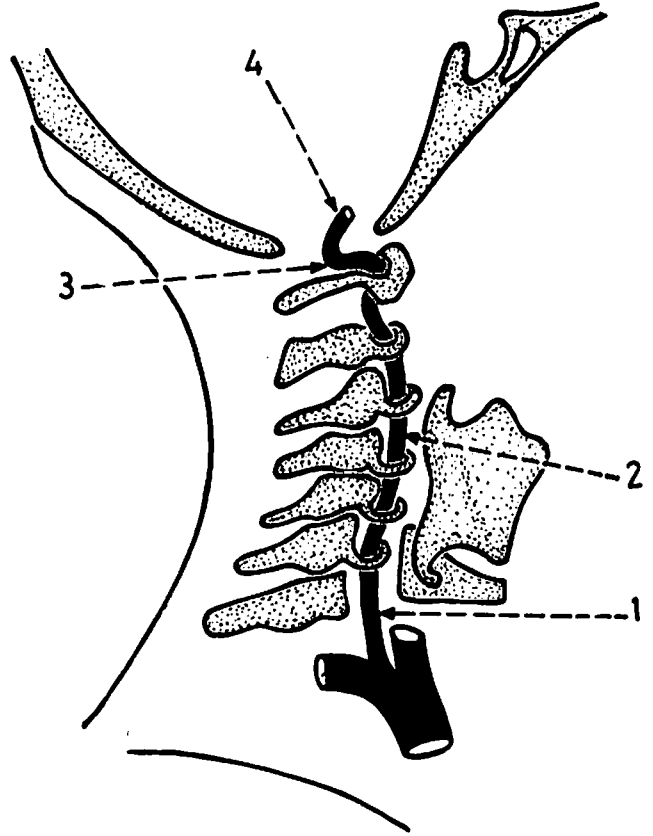


Fig.(479): RELATIONS OF 1st PART OF VERTEBRAL ARTERY

It is related in front to the common carotid artery in the carotid sheath and is crossed by the inferior thyroid artery. It is related behind to the transverse process of 7th cervical vertebra, ventral rami of 7th and 8th cervical nerves and inferior cervical ganglion.

1. common carotid artery (cut).
2. vertebral artery (1st part).
3. inferior thyroid artery.
4. 7th cervical nerve.
5. scalenus anterior.
6. transverse process of 7th C.V.
7. 8th cervical nerve.
8. inferior cervical ganglion.
9. longus colli muscle.

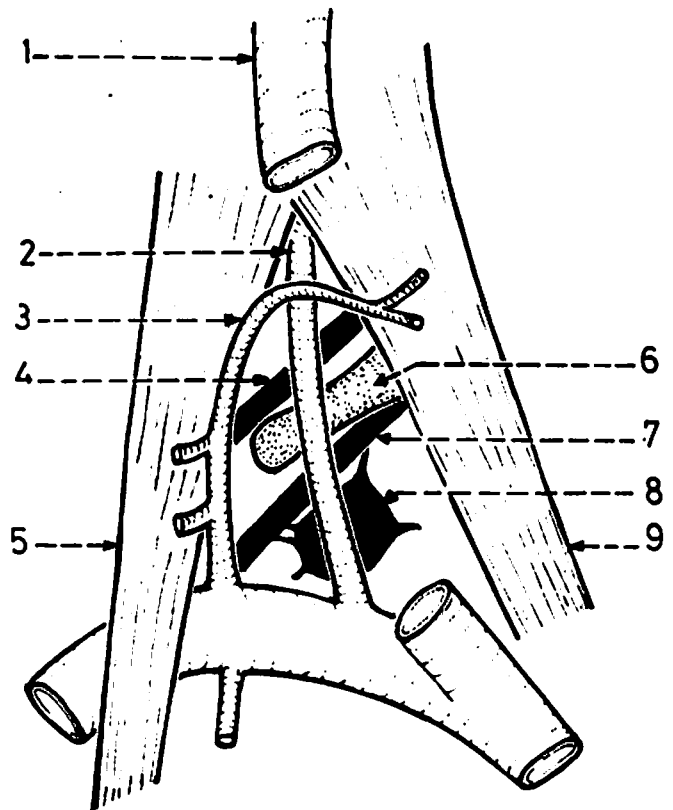


Fig.(480): RELATIONS OF 2nd AND 3rd PARTS OF VERTEBRAL ARTERY

The 2nd part lies in front of the ventral rami of cervical nerves from 2 to 6. It is surrounded by sympathetic fibres and accompanied by a plexus of veins. The 3rd part lies in a groove on the posterior arch of the atlas behind the lateral mass. It is related to the dorsal and ventral rami of the 1st cervical nerve which lie between it and the bone.

1. ventral ramus of 6th cervical nerve.
2. dorsal ramus of 1st cervical nerve (between the 3rd part and the posterior arch of atlas).
3. 3rd part of vertebral artery.
4. atlas vertebra.
5. ventral ramus of 1st cervical nerve (between the artery and the lateral mass of atlas).
6. sympathetic fibres around the 2nd part of the artery.
7. 2nd part of vertebral artery.
8. inferior cervical ganglion.
9. 1st part of vertebral artery.

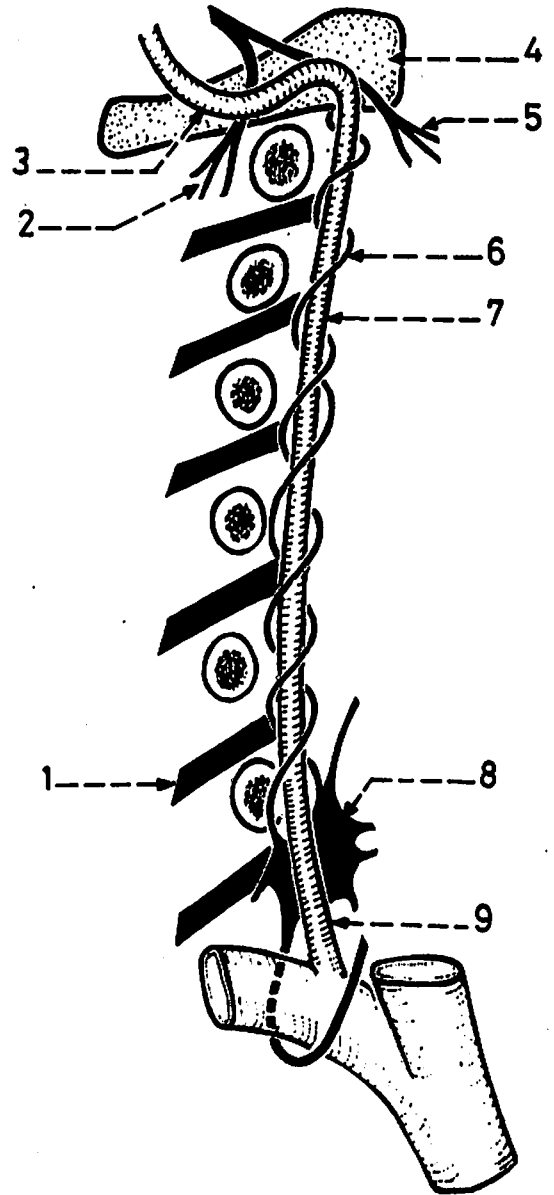


Fig.(481): 3rd PART OF VERTEBRAL ARTERY

It lies in a groove on the posterior arch of atlas behind the lateral mass. It forms a curve at its junction with the 2nd part.

1. dorsal ramus of 1st cervical nerve (between the artery and the posterior arch of the atlas).
2. 3rd part of the artery.
3. 2nd part of the artery.

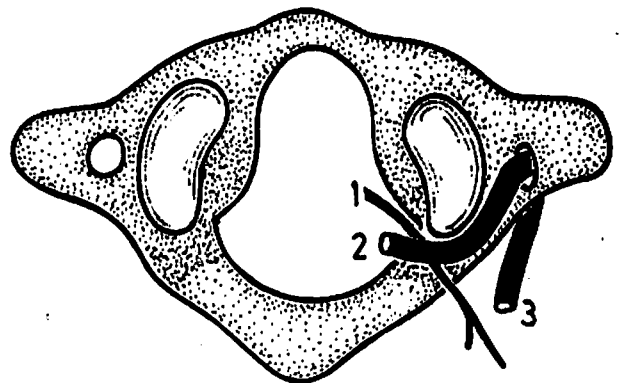




Fig.(482): BRANCHES OF VERTEBRAL ARTERY

The 1st part has no branches, the 2nd part has spinal branches to the spinal cord, the 3rd part has muscular branches in the suboccipital triangle, and the 4th part has numerous branches to the hind brain and spinal cord (posterior inferior cerebellar, medullary, anterior spinal and posterior spinal).

1. anterior spinal artery (formed by union of the 2 anterior spinal arteries of both sides).
2. posterior spinal artery.
3. 4th part of vertebral artery.
4. basilar artery (formed by the union of the 2 vertebral arteries).
5. posterior inferior cerebellar artery.
6. 2nd part of vertebral artery.
7. spinal branch which passes through the intervertebral foramen to reach the spinal cord.

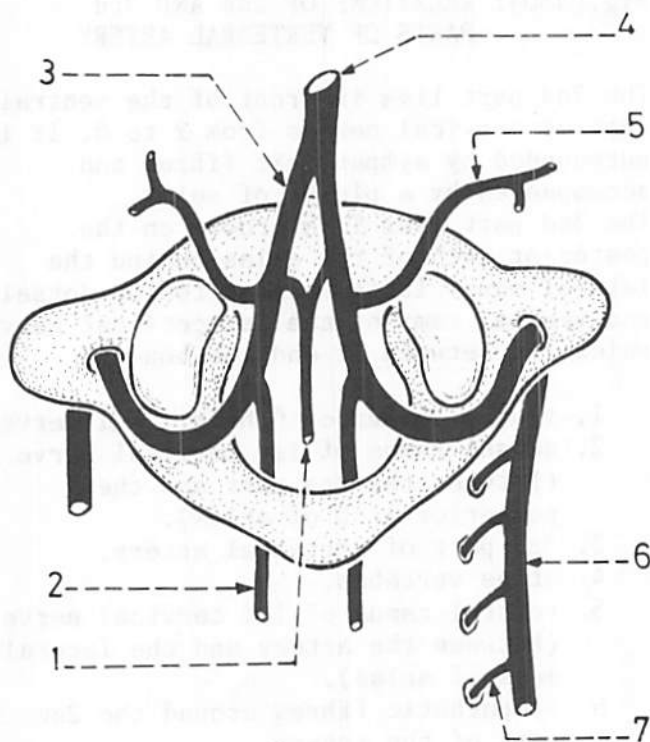
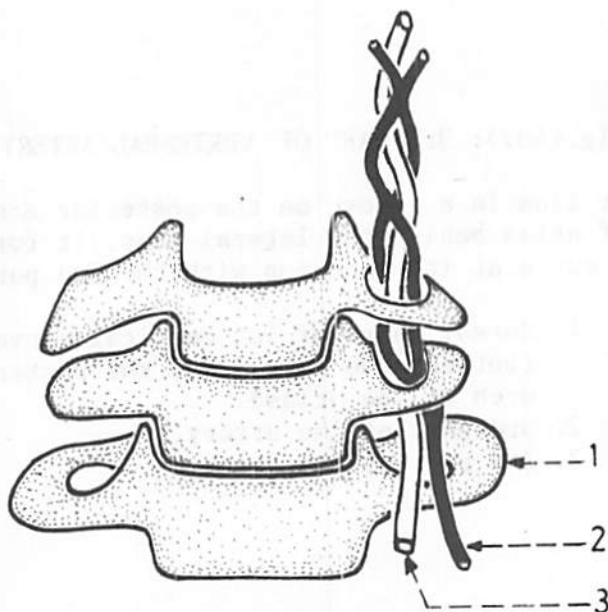


Fig.(483): VERTEBRAL VEIN

It arises in the suboccipital triangle and descends through the foramina transversaria of the upper 6 cervical vertebrae in the form of a plexus of veins. This plexus forms a single vein which accompanies the 1st part of the artery to end in the innominate vein.

1. transverse process of 7th C.V.
2. vertebral vein.
3. 1st part of vertebral artery.





## JUGULAR VEINS

Fig.(484): ANTERIOR, EXTERNAL AND INTERNAL JUGULAR VEINS

The anterior and external jugular veins are superficial veins, while the internal jugular vein is deeply situated under cover of the sternomastoid muscle.

1. external jugular vein (lies in the side of the neck).
2. anterior jugular vein (lies in the front of the neck).
3. internal jugular vein (lies in the side of the neck separated from the external jugular by the sternomastoid).

\* The anterior jugular vein ends in the external jugular vein, and the external jugular vein ends in the subclavian vein.

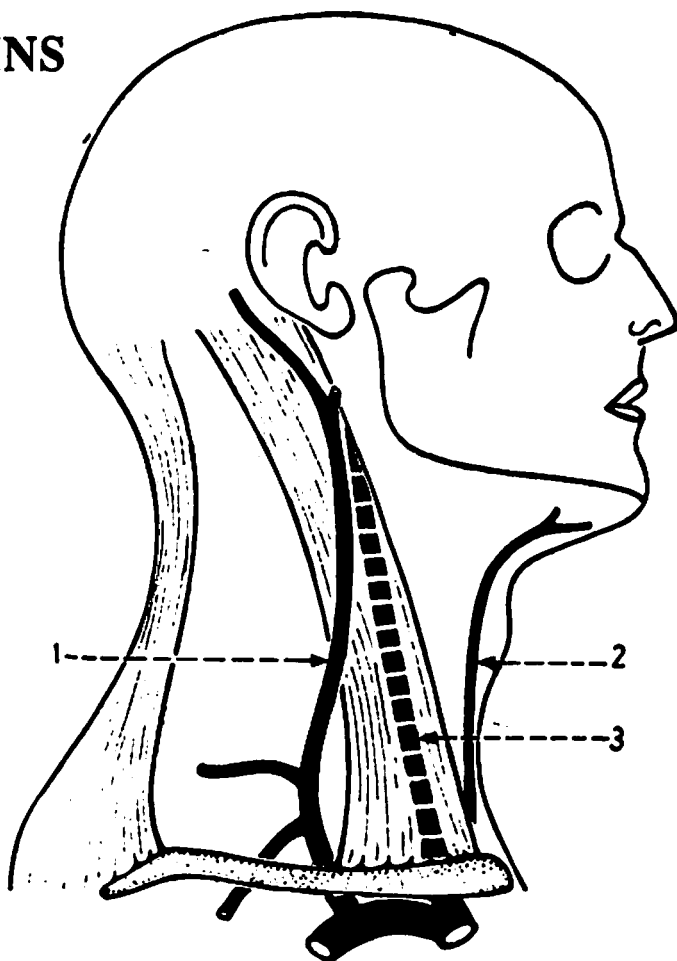


Fig.(485): ANTERIOR JUGULAR VEIN

It begins near the hyoid bone and descends close and parallel to the midline of the neck. Just above the sternum it turns laterally deep to the sternomastoid to join the external jugular vein. The 2 anterior jugular veins are joined together above the sternum by the jugular arch.

1. midline of the neck.
2. sternohyoid muscle.
3. jugular arch (between the 2 veins just above the sternum).
4. anterior jugular vein.
5. anterior jugular vein turning laterally deep to the sternomastoid.

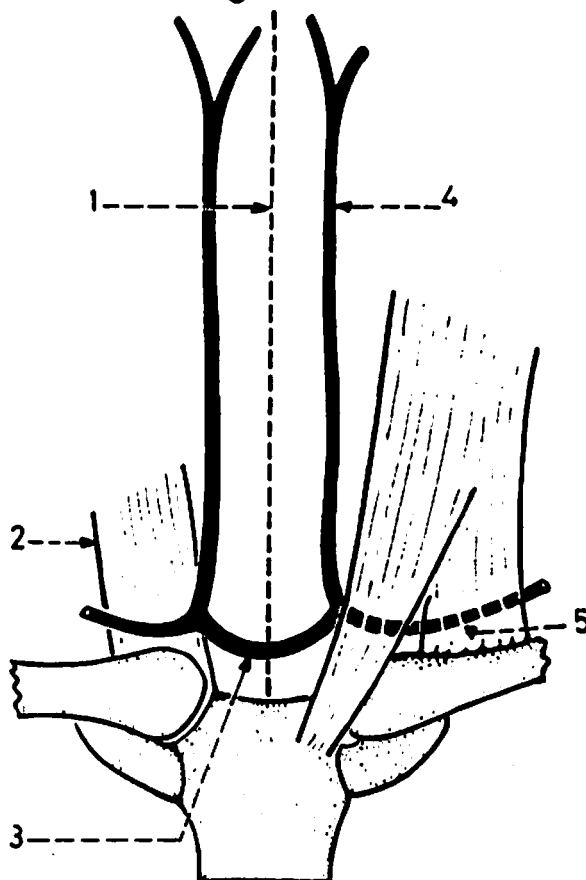


Fig.(486): EXTERNAL JUGULAR VEIN

It begins at the lower end of the parotid gland and descends superficial to the sternomastoid to enter the posterior triangle where it ends in the subclavian vein.

1. posterior auricular vein.
2. sternomastoid.
3. great auricular nerve (ascends close to the vein).
4. external jugular vein.
5. the point where the vein pierces the fascia of the roof of the posterior triangle.
6. transverse cervical vein.
7. suprascapular vein.
8. trunks of brachial plexus.
9. posterior division of retromandibular vein.
10. transverse cutaneous nerve of the neck.
11. anterior jugular vein.
12. subclavian vein.

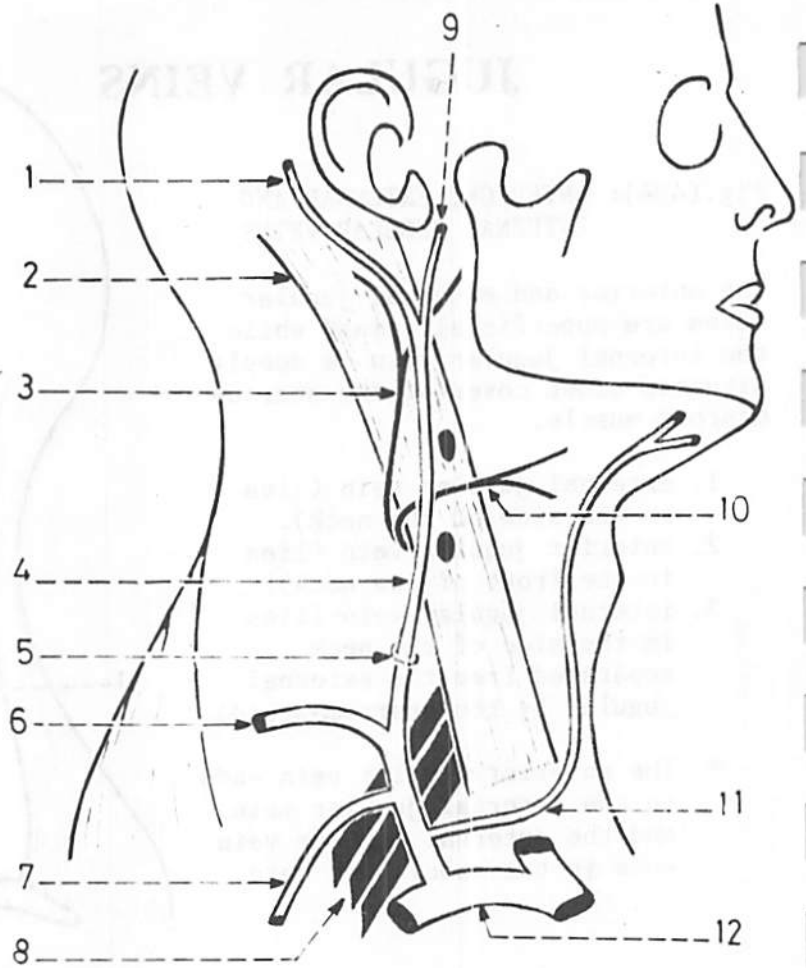


Fig.(487): COURSE OF INTERNAL JUGULAR VEIN

It begins at the jugular foramen as the continuation of the sigmoid sinus. It runs downwards in the carotid sheath over the origins of the levator scapulae and scalenus anterior muscles to end below by joining the subclavian vein to form the innominate vein.

1. transverse process of atlas vertebra.
2. levator scapulae.
3. scalenus anterior.
4. superior bulb of the vein (in the jugular foramen).
5. internal jugular vein.
6. subclavian artery.
7. inferior bulb of the vein.
8. innominate vein.
9. subclavian vein.

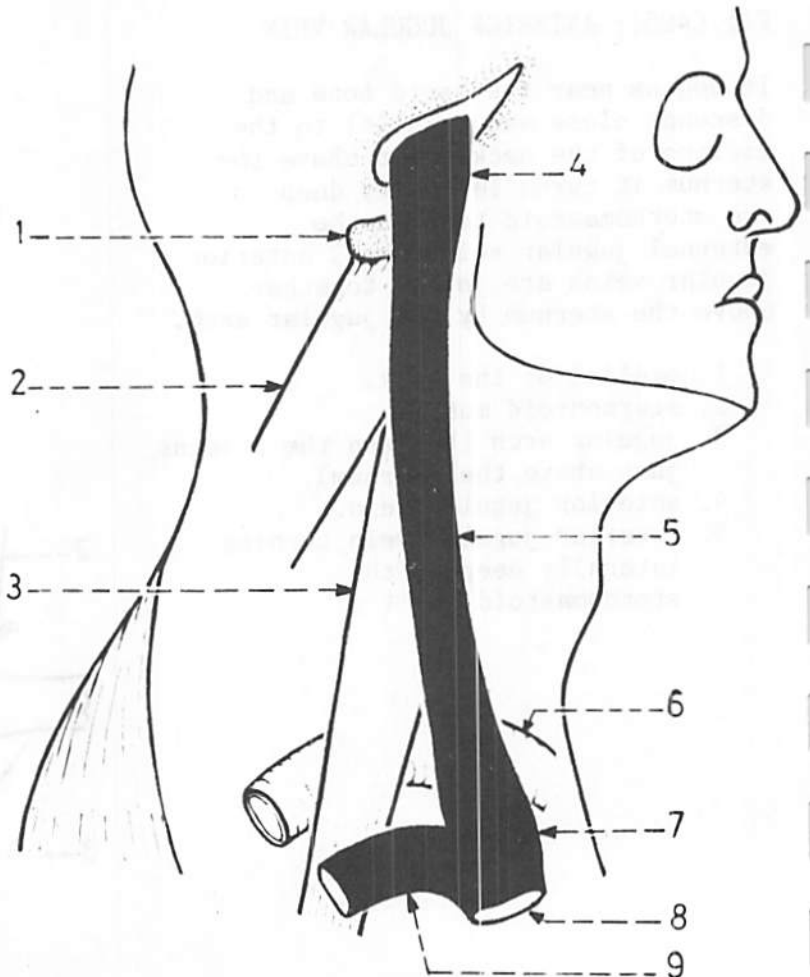


Fig.(488): TRIBUTARIES OF INTERNAL JUGULAR VEIN

These are the inferior petrosal sinus, common facial, pharyngeal, lingual, superior thyroid and middle thyroid veins.

1. superior bulb of internal jugular vein.
2. inferior bulb of internal jugular vein.
3. subclavian vein.
4. inferior petrosal sinus (joins the superior bulb).
5. common facial vein.
6. lingual vein.
7. superior thyroid vein.
8. middle thyroid vein.
9. innominate vein.

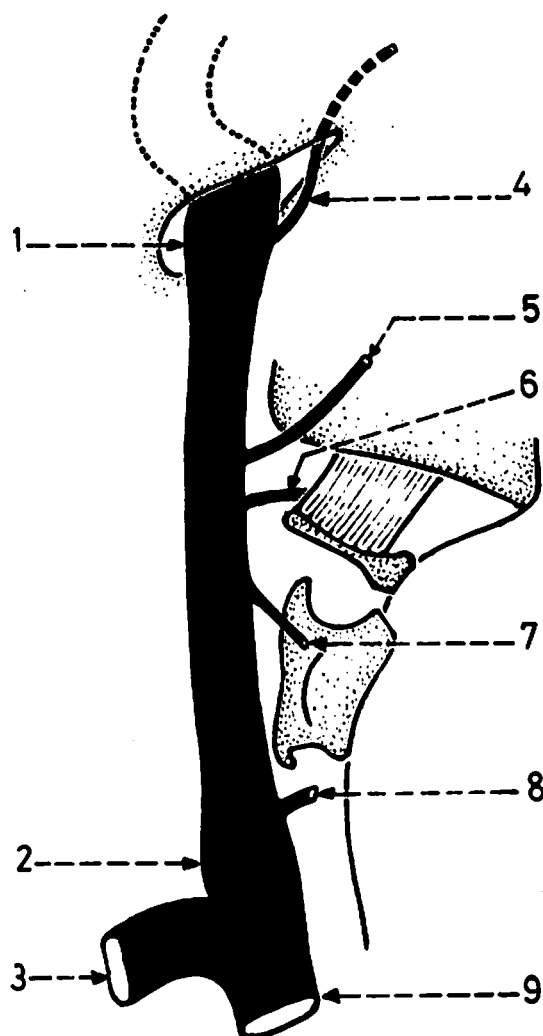


Fig.(489): SURFACE ANATOMY OF INTERNAL JUGULAR VEIN

It is represented by a line drawn from the lobule of the ear above (point 1) to the medial end of the clavicle below (point 2).

- \* The inferior bulb lies behind the fossa between the sternal and clavicular heads of sternomastoid.

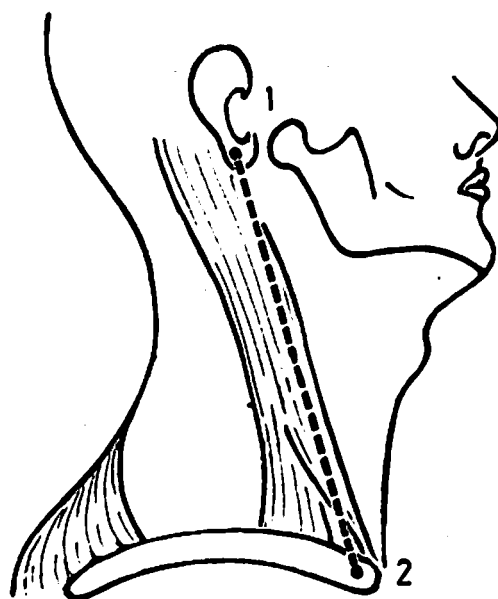


Fig.(490): RELATIONS OF INTERNAL JUGULAR VEIN TO THE CAROTID ARTERIES AND CRANIAL NERVES

The vein lies in the carotid sheath lateral to the internal and common carotid arteries having the vagus nerve in between and on a more posterior plane. At the base of the skull the vein lies behind the internal carotid artery with the last 4 cranial nerves (9, 10, 11, 12) in between.

1. internal jugular vein.
2. accessory nerve crossing over the upper part of the vein.
3. internal carotid artery.
4. external carotid artery.
5. glossopharyngeal nerve.
6. hypoglossal nerve.
7. vagus nerve.

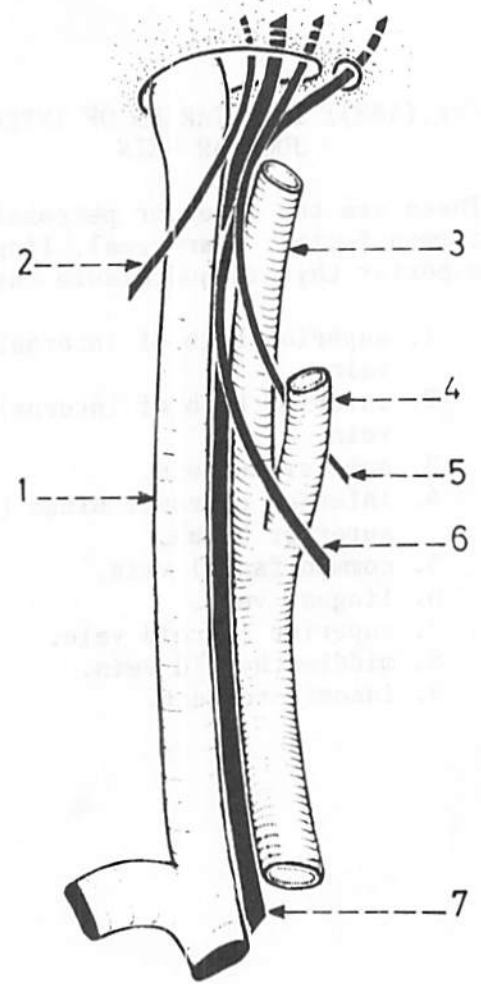
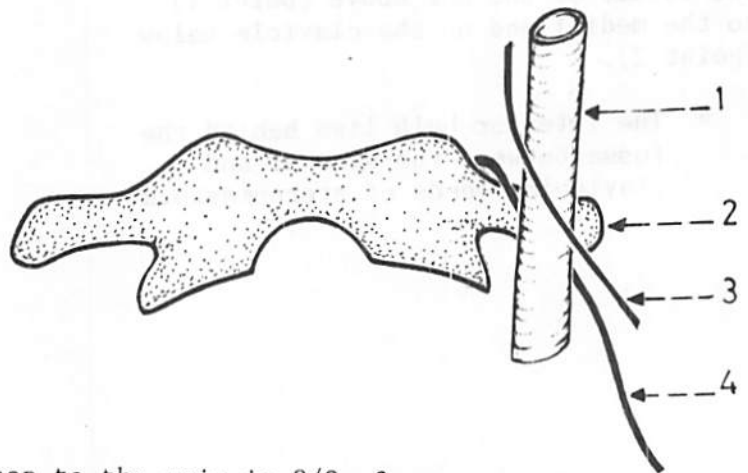


Fig.(491): RELATION OF INTERNAL JUGULAR VEIN TO THE TRANSVERSE PROCESS OF ATLAS VERTEBRA

The vein lies in front of the transverse process of the atlas vertebra with the ventral ramus of the 1st cervical nerve in between. Here the accessory nerve crosses superficial to the vein.

1. upper part of internal jugular vein.
2. transverse process of atlas vertebra.
3. accessory nerve (superficial to the vein).
4. ventral ramus of 1st cervical nerve (deep to the vein).



N.B.: The accessory nerve runs deep to the vein in 2/3 of cases.

Fig.(492): OTHER RELATIONS OF  
INTERNAL JUGULAR VEIN

The vein is crossed by posterior belly of digastric above and inferior belly of omohyoid below. It is also crossed by 2 nerves: accessory nerve above and inferior root of ansa cervicalis below. The deep cervical lymph nodes lie alongside the vein in the form of a chain.

1. spinal root of accessory nerve.
2. posterior belly of digastric.
3. deep cervical lymph nodes.
4. inferior root of ansa cervicalis.
5. inferior belly of omohyoid.
6. ansa cervicalis.
7. internal jugular vein.

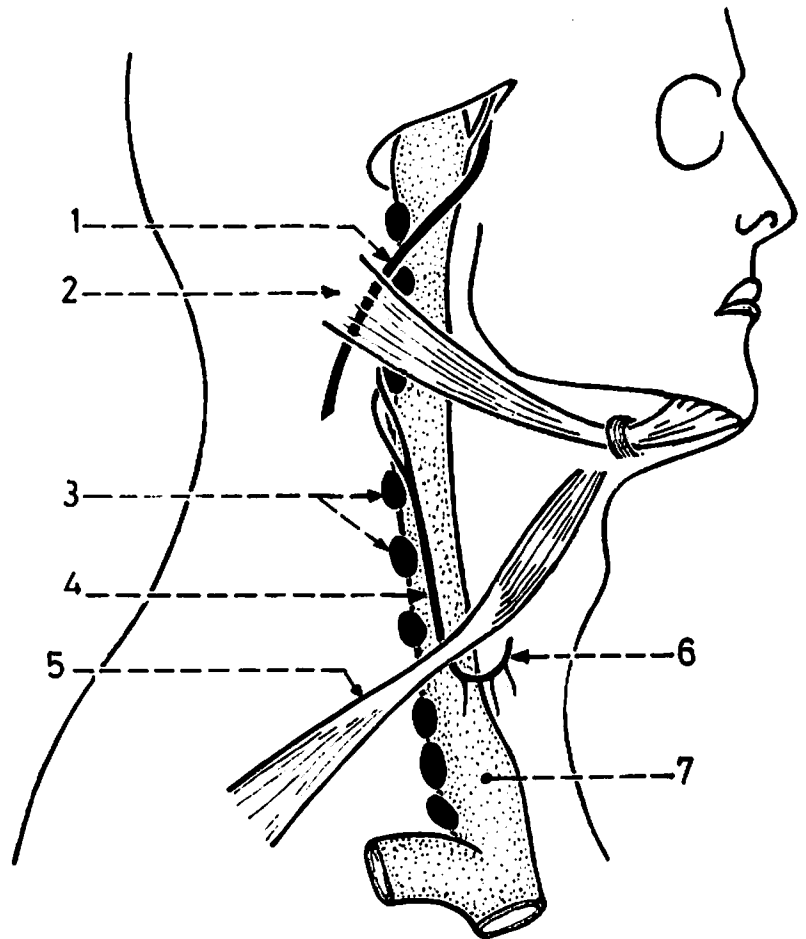
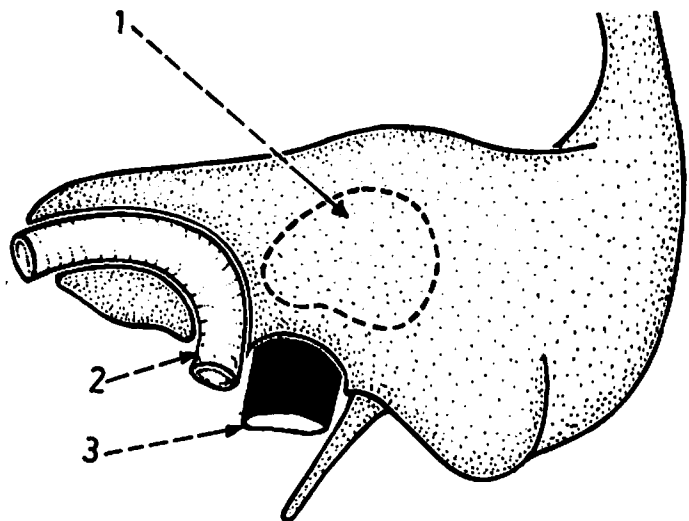


Fig.(493): RELATION OF INTERNAL  
JUGULAR VEIN TO THE  
MIDDLE EAR

The superior bulb of the vein lies in the jugular foramen and here it is situated just below the floor of the middle ear.

1. middle ear (tympanic cavity).
2. internal carotid artery in the carotid canal.
3. internal jugular vein just below the middle ear.



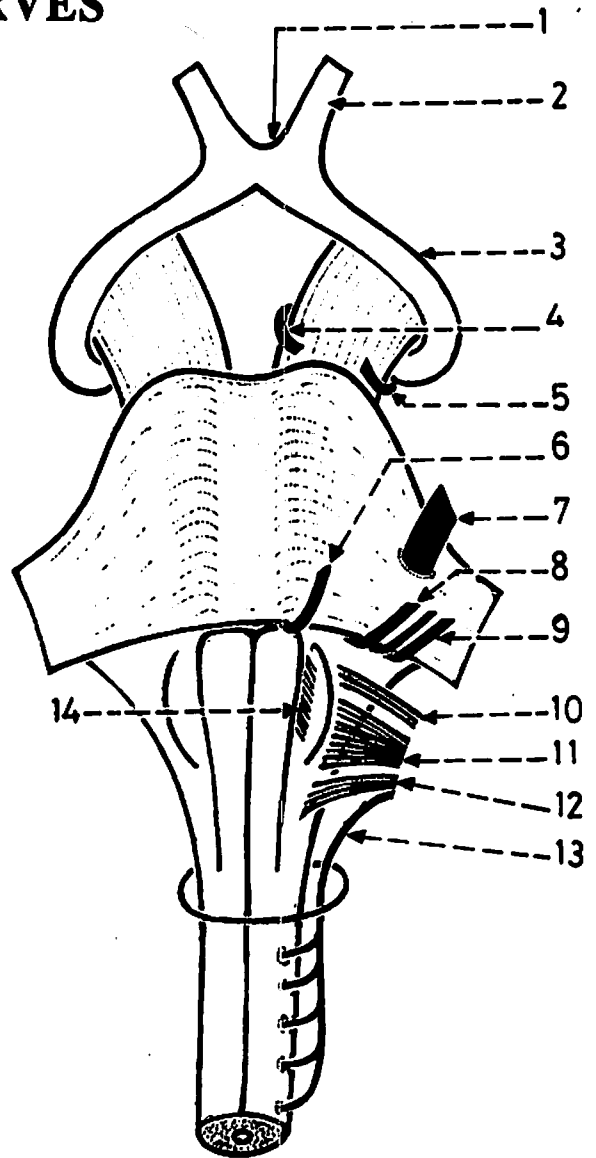
## CRANIAL NERVES

Fig.(494): EXTERNAL ATTACHMENTS  
OF CRANIAL NERVES

There are 12 pairs of cranial nerves which are attached to the brain and brain stem. With the exception of the 1st and 2nd nerves which are attached directly to the cerebral hemispheres, all the cranial nerves are attached to the brain stem (midbrain, pons and medulla oblongata).

1. optic chiasma.
2. optic nerve.
3. optic tract.
4. oculomotor nerve.
5. trochlear nerve.
6. abducent nerve.
7. trigeminal nerve.
8. facial nerve.
9. vestibulocochlear nerve.
10. glossopharyngeal nerve.
11. vagus nerve.
12. cranial root of accessory nerve.
13. spinal root of accessory nerve.
14. hypoglossal nerve.

\* These nerves may be sensory (1,2,8), motor (3,4,6,11,12) or mixed (5,7,9,10). Some nerves contain parasympathetic fibres (3,7,9,10).



### OLFACTORY NERVE

Fig.(495): BUNDLES OF OLFACTORY NERVE

The olfactory nerve is the nerve of smell. It consists of about 20 bundles of nerve fibres which pass through the cribriform plate of the ethmoid to end in the olfactory bulb.

1. olfactory tract.
2. olfactory bulb (a collection of nerve cells on the side of the crista galli).
3. bundles of olfactory nerve passing through the cribriform plate of ethmoid.

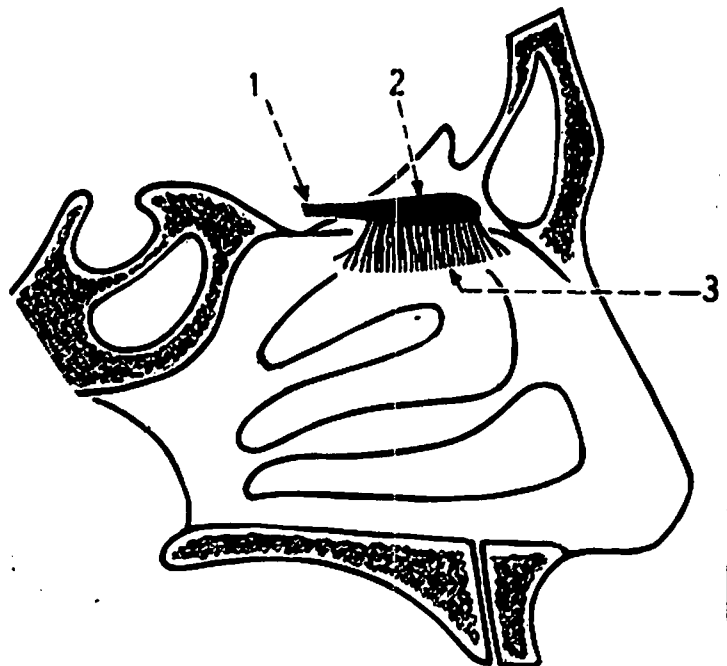
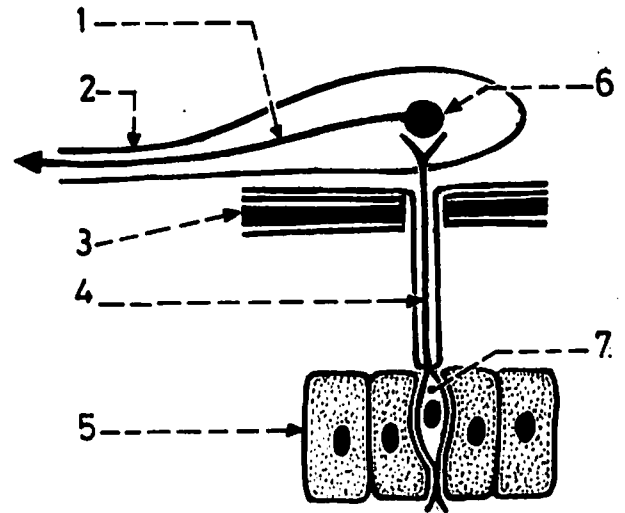


Fig.(496): ORIGIN AND TERMINATION OF OLFACTORY NERVE FIBRES

Olfactory fibres arise from special bipolar cells in the olfactory mucosa, and terminate by relaying on the mitral cells in the olfactory bulb.

1. axon of a mitral cell passing in the olfactory tract.
2. olfactory tract.
3. floor of anterior cranial fossa.
4. olfactory nerve fibre.
5. olfactory mucosa.
6. mitral cell in the olfactory bulb.
7. olfactory bipolar cell.



## OPTIC NERVE

Fig.(497): FIBRES OF THE OPTIC NERVE

The optic nerve is the nerve of sight. Its fibres arise in the ganglionic layer of the retina, converge on the optic disc and pierce the posterior part of the sclera to form the optic nerve.

1. fibres from nasal part of the retina.
2. optic disc.
3. fibres from temporal part of the retina.
4. optic nerve.

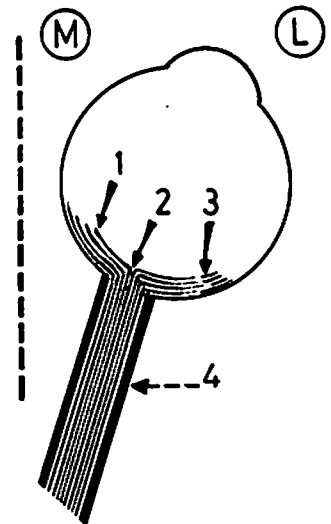


Fig.(498): OPTIC CHIASMA

The optic chiasma is formed by the decussating nasal fibres of the optic nerves of both sides.

1. decussating nasal fibres.
2. optic nerve.
3. temporal fibres (do not decussate).
4. optic tract (temporal fibres of the same side together with nasal fibres of the opposite side).

\* The optic chiasma lies above and in front of the pituitary gland, and thus may be compressed by pituitary tumours.

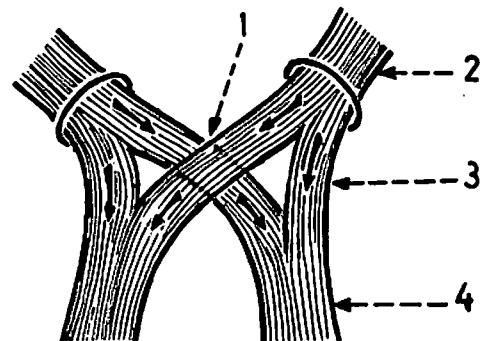


Fig.(499): ORIGIN OF OPTIC NERVE FIBRES

They are the axons of the ganglionic cells of the retina. They collect together to form the innermost layer of the retina and converge on the optic disc to form the optic nerve.

1. optic nerve.
2. ganglionic cells.
3. optic nerve fibres converging at the optic disc.
4. bipolar cell of retina.
5. rods and cones.
6. choroid.
7. sclera.

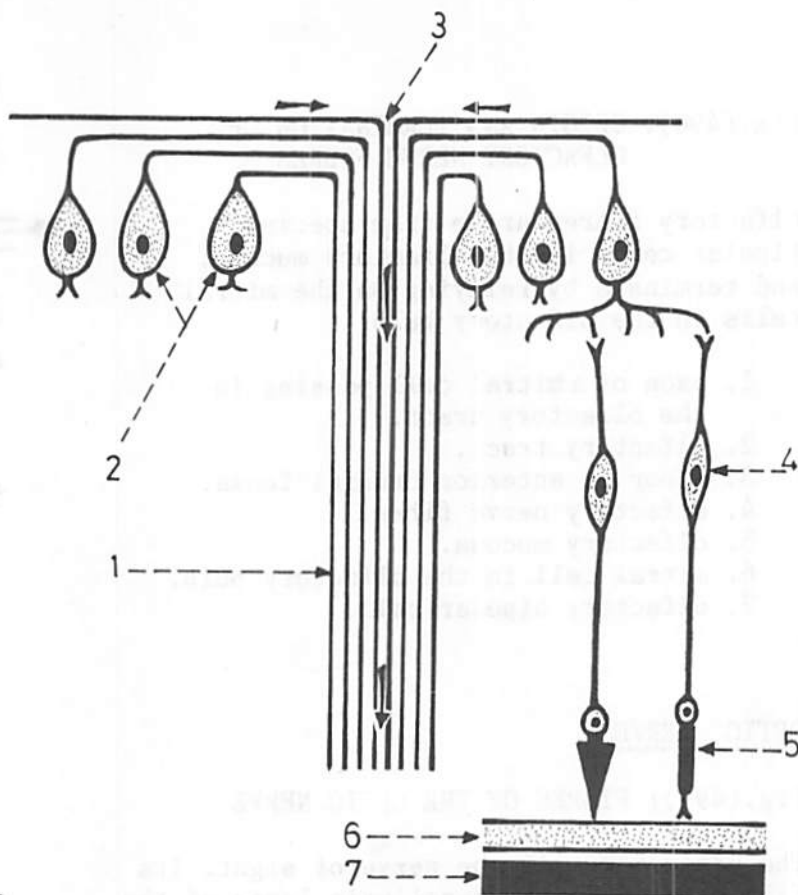


Fig.(500): SHEATHS OF OPTIC NERVE

The nerve is surrounded by 3 sheaths which are continuous with the 3 meninges of the brain. They blend distally with the wall of the eyeball.

1. central artery of retina (runs in the subarachnoid space around the optic nerve and pierces the nerve 12 mm behind the eyeball).
2. optic disc.
3. retina.
4. choroid.
5. sclera.
6. arachnoid sheath.
7. dural sheath.
8. subarachnoid space around the optic nerve.
9. optic nerve.

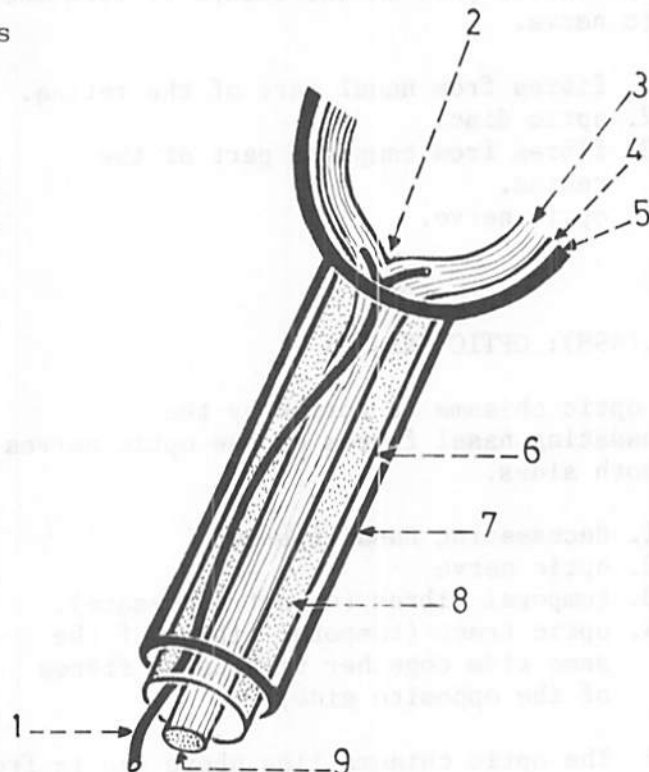




Fig.(501): PAPHILLOEDEMA

It is the condition of oedema of the optic disc due to increased intracranial pressure. The increased pressure of C.S.F. in the subarachnoid space around the optic nerve compresses the central vein of the retina resulting in oedema of the disc.

1. papilloedema.
2. dural sheath.
3. optic nerve.
4. central vein of retina.

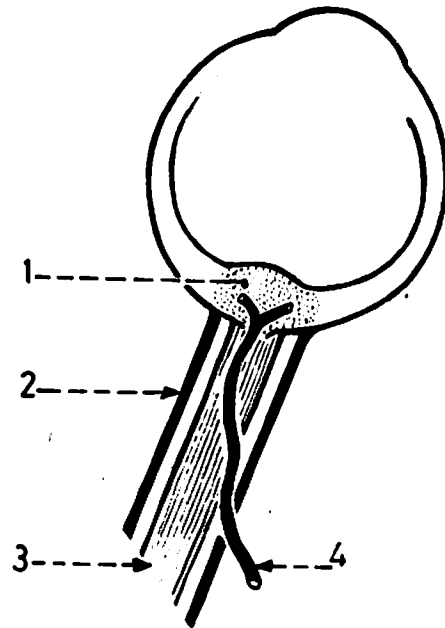


Fig.(502): NERVES RELATED TO OPTIC NERVE

These are the nasociliary nerve which crosses above the optic nerve and the nerve to the medial rectus which passes medially below the optic nerve.

1. nasociliary nerve.
2. optic nerve.
3. nerve to medial rectus.
4. ciliary ganglion (lateral to the optic nerve).

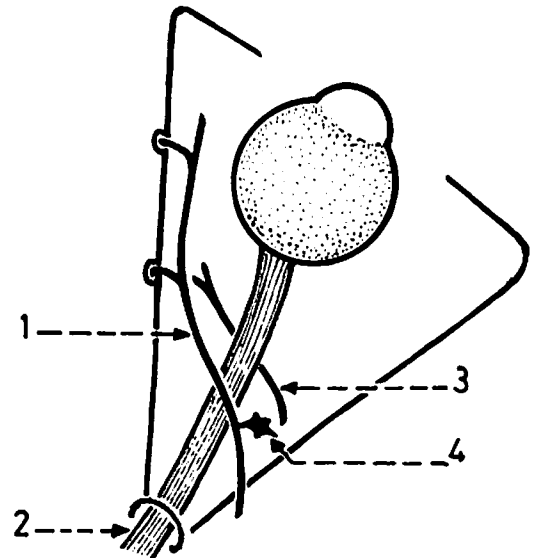
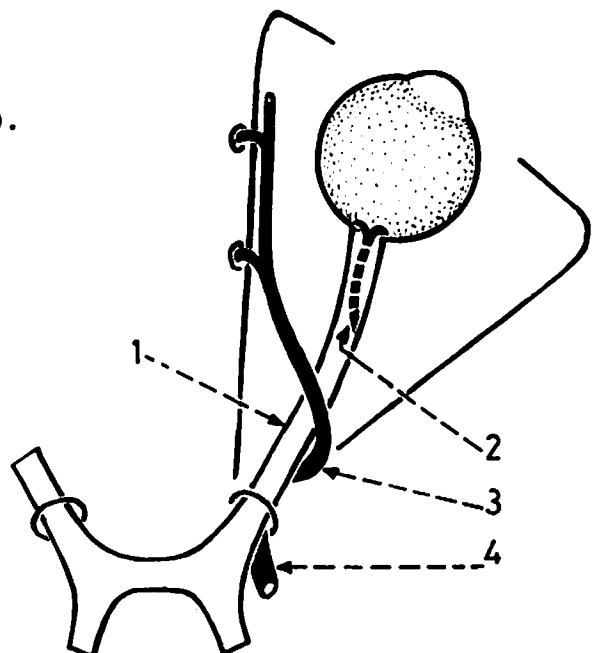


Fig.(503): ARTERIES RELATED TO THE OPTIC NERVE

These are the ophthalmic artery and central artery of the retina.

1. optic nerve.
2. central artery of the retina (pierces the optic nerve 12 mm from the eyeball).
3. ophthalmic artery crossing over the nerve from lateral to medial (just in front of the optic canal).
4. ophthalmic artery below the optic nerve (in the optic canal).



OCULOMOTOR NERVE

Fig.(504): COURSE AND BRANCHES OF OCULOMOTOR NERVE

The nerve arises from a nucleus which lies in the upper part of the midbrain. The nerve emerges on the medial surface of the cerebral peduncle and here it passes between the superior cerebellar and posterior cerebral arteries. It then passes forwards into the lateral wall of the cavernous sinus above the trochlear nerve. It divides into superior and inferior divisions which enter the orbit through the superior orbital fissure. It supplies all the extraocular muscles except the lateral rectus and superior oblique.

1. superior division of oculomotor nerve.
2. superior orbital fissure.
3. branch to the ciliary ganglion.
4. inferior division of oculomotor nerve.
5. superior cerebellar artery.
6. posterior cerebral artery.
7. cerebral peduncle of midbrain.
8. nucleus of oculomotor nerve.

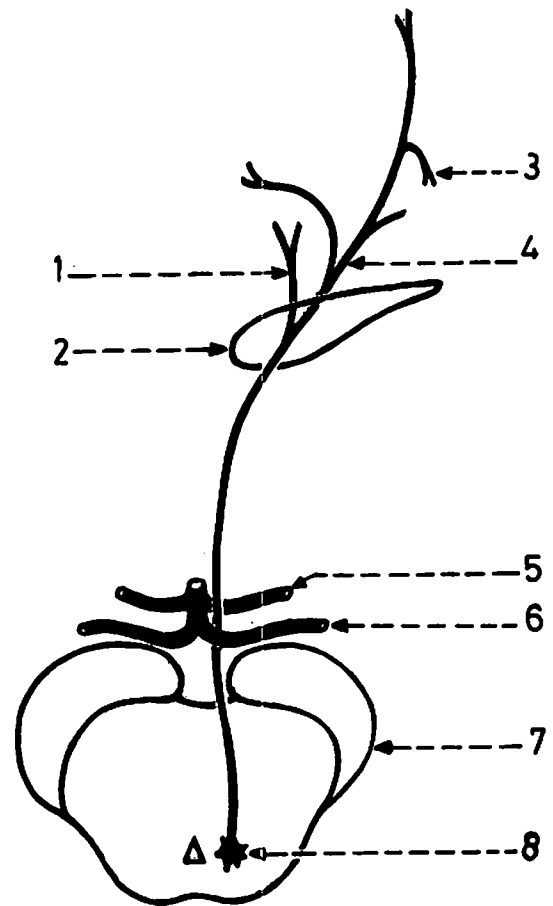
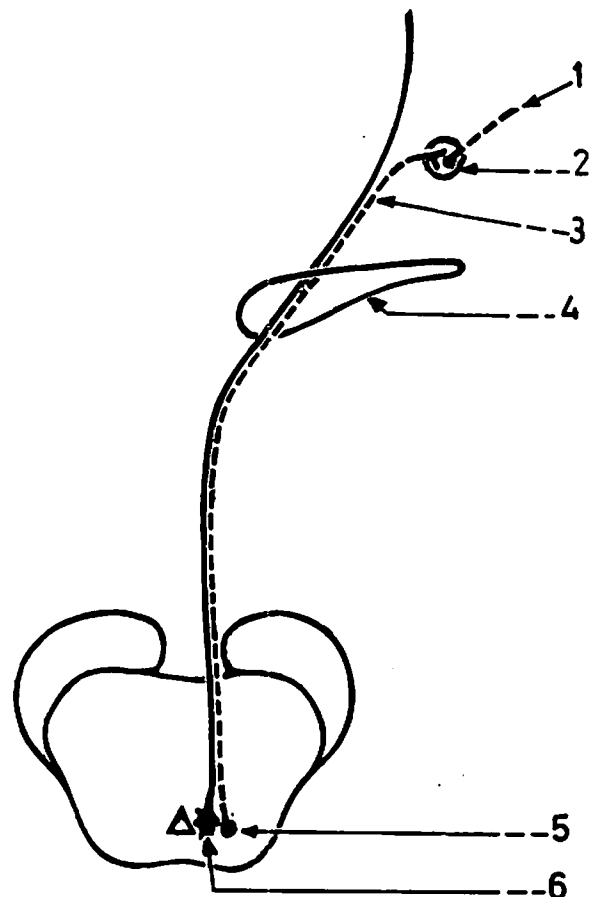


Fig.(505): PARASYMPATHETIC FIBRES IN THE OCULOMOTOR NERVE

These fibres arise from a part of the oculomotor nucleus called Edinger-Westphal nucleus. These are preganglionic fibres which relay in the ciliary ganglion, and the postganglionic fibres run in the short ciliary nerves to supply the sphincter pupillae and ciliary muscle.

1. postganglionic fibres.
2. ciliary ganglion.
3. preganglionic fibres.
4. superior orbital fissure.
5. Edinger-Westphal nucleus.
6. nucleus of oculomotor nerve.



TROCHLEAR NERVE

Fig.(506): COURSE OF TROCHLEAR NERVE

Its nucleus lies in the lower part of the midbrain, and its fibres emerge on the posterior surface of the brain stem where they decussate in the superior medullary velum. The nerve then passes forwards on the side of the cerebral peduncle to appear between the superior cerebellar and posterior cerebral arteries. It continues forwards in the lateral wall of the cavernous sinus and enters the orbit through the superior orbital fissure to supply the superior oblique muscle.

1. nucleus of trochlear nerve.
2. superior oblique muscle.
3. superior orbital fissure.
4. superior cerebellar artery.
5. posterior cerebral artery.
6. trochlear nerve.
7. decussation of the 2 trochlear nerves in the superior medullary velum.

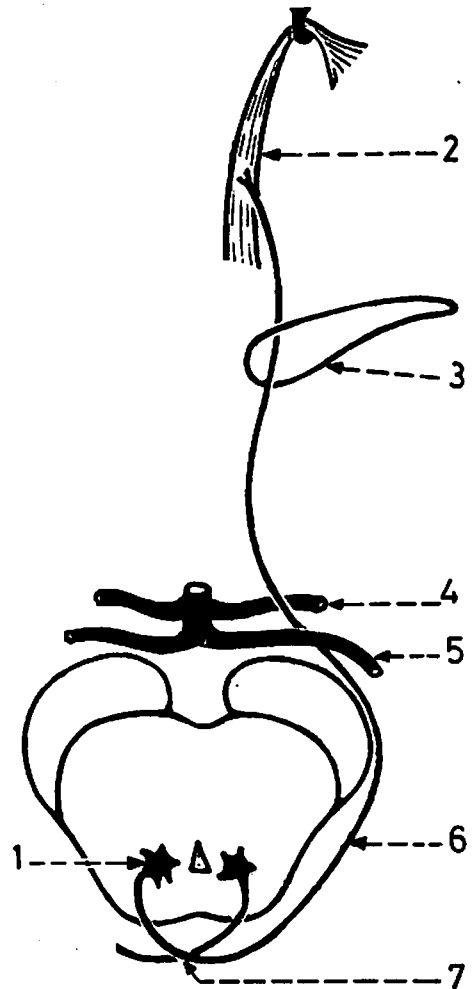
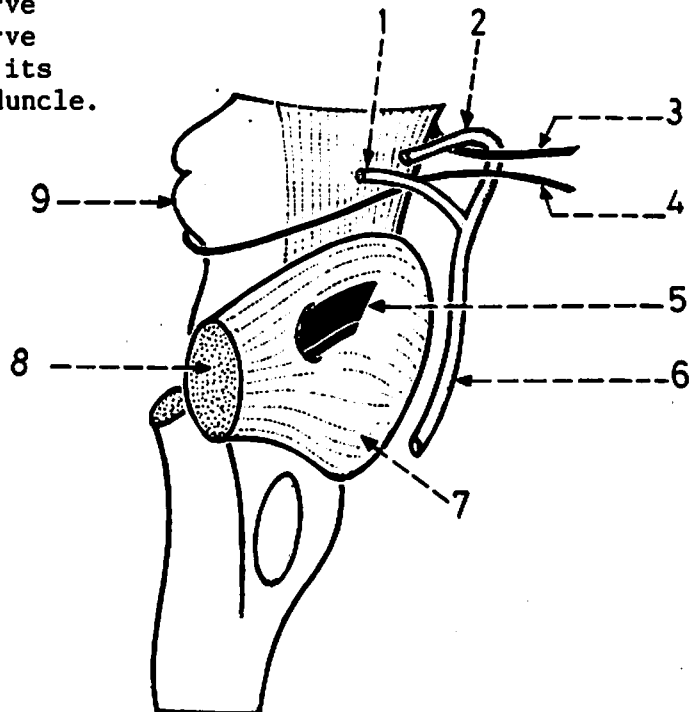


Fig.(507): EXTERNAL ATTACHMENTS OF THE 3rd, 4th AND 5th CRANIAL NERVES

The oculomotor nerve emerges on the front of the midbrain while the trochlear nerve emerges on its back. The trigeminal nerve is attached to the side of the pons at its junction with the middle cerebellar peduncle.

1. superior cerebellar artery.
2. posterior cerebral artery.
3. oculomotor nerve.
4. trochlear nerve.
5. trigeminal nerve.
6. basilar artery.
7. pons.
8. middle cerebellar peduncle.
9. tectum of midbrain.



TRIGEMINAL NERVE

Fig.(508): NUCLEI OF TRIGEMINAL NERVE

These are one motor and 3 sensory nuclei (mesencephalic, main sensory and spinal).

1. mesencephalic nucleus (in the midbrain).
2. motor nucleus (in the pons).
3. main sensory nucleus (in the pons).
4. spinal nucleus (in the medulla oblongata).
5. sensory root of trigeminal nerve (its fibres end in the 3 sensory nuclei).
6. motor root (its fibres arise from the motor nucleus).
7. pons.

\* The mesencephalic nucleus is concerned with proprioception, the main sensory nucleus with touch and pressure while the spinal nucleus is concerned with pain and temperature.

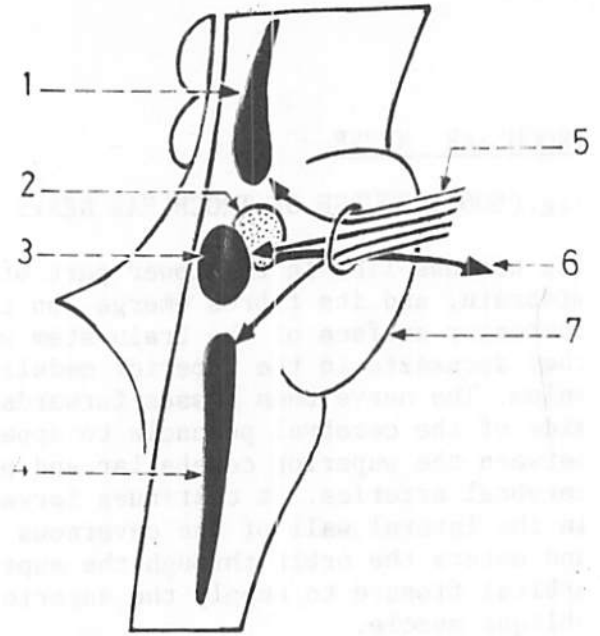


Fig.(509): ROOTS OF TRIGEMINAL NERVE

The nerve has a large sensory root and a smaller motor root. The 2 roots cross over the upper border of the petrous bone near its apex deep to the superior petrosal sinus.

1. superior petrosal sinus.
2. motor root.
3. sensory root.
4. internal acoustic meatus.
5. sigmoid sinus.

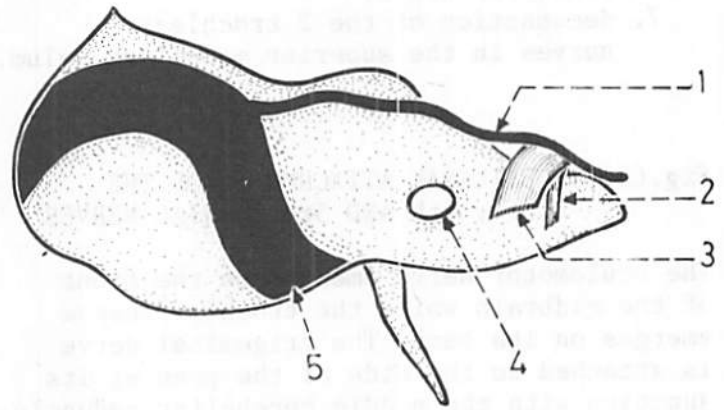


Fig.(510): TRIGEMINAL GANGLION IN THE CAVUM TRIGEMINALE

The trigeminal ganglion is surrounded by a sheath of dura mater which forms the cavum trigeminale.

1. sensory root of trigeminal nerve.
2. fossa for trigeminal ganglion on the anterior surface of petrous temporal bone.
3. superior petrosal sinus.
4. trigeminal ganglion.
5. dura mater of the cavum trigeminale.
6. dura mater of the middle cranial fossa.

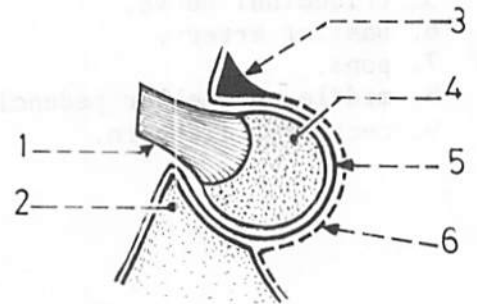
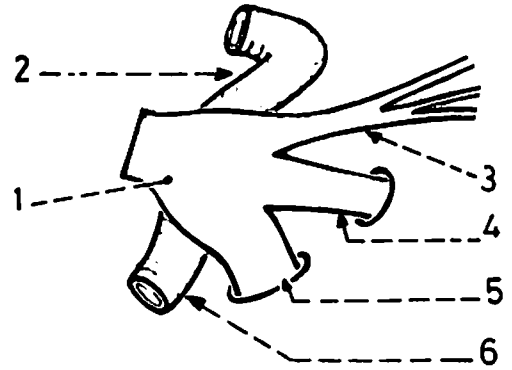


Fig.(511): TRIGEMINAL GANGLION  
AND ITS 3 BRANCHES

The ganglion has 3 peripheral branches called ophthalmic, maxillary and mandibular.



1. trigeminal ganglion.
2. internal carotid artery in the cavernous sinus medial to the ganglion.
3. ophthalmic nerve.
4. maxillary nerve.
5. mandibular nerve.
6. internal carotid artery traversing the foramen lacerum below the ganglion.

\* The ophthalmic, maxillary and mandibular nerves have been described in previous chapters.

ABDUCENT NERVE

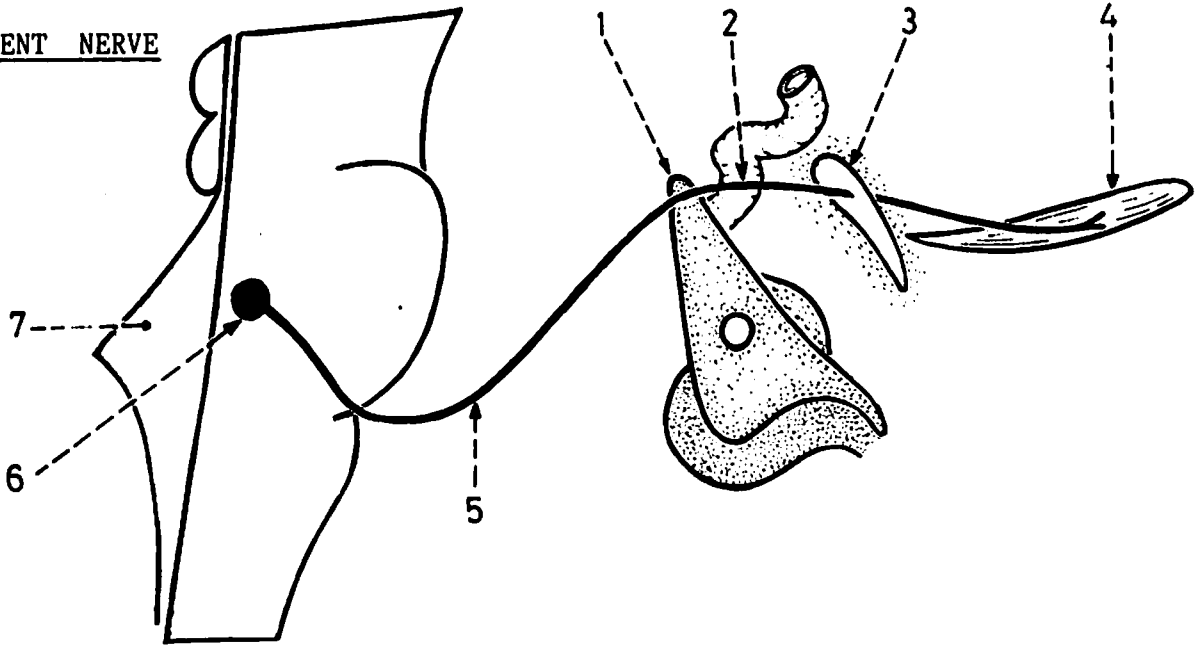


Fig.(512): COURSE OF ABDUCENT NERVE

Its nucleus lies in the pons and its fibres emerge at the junction between the pons and medulla oblongata. The nerve then passes upwards and forwards to cross over the apex of the petrous temporal bone. It then passes within the cavernous sinus and enters the orbit through the superior orbital fissure to supply the lateral rectus.

1. apex of petrous temporal bone (crossed by the nerve).
2. abducent nerve in the cavernous sinus lateral to the internal carotid artery.
3. superior orbital fissure.
4. lateral rectus muscle.
5. abducent nerve in the posterior cranial fossa.
6. nucleus of abducent nerve in the pons.
7. 4th ventricle.

FACIAL NERVE

Fig.(513): NUCLEI OF FACIAL NERVE

These are 3 nuclei: motor nucleus, superior salivatory nucleus and nucleus solitarius.

1. motor nucleus of facial nerve (in the pons).
2. nucleus solitarius (in the medulla oblongata and receives taste fibres).
3. superior salivatory nucleus (in the pons and gives rise to parasympathetic fibres).
4. nucleus of abducent nerve (surrounded by motor fibres of the facial nerve to form the facial colliculus).

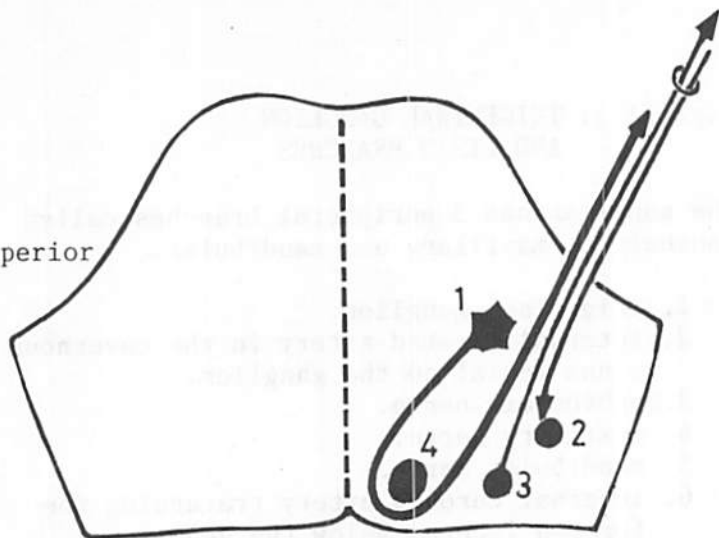


Fig.(514): UPPER MOTOR AND LOWER MOTOR NEURONS OF FACIAL NERVE

The upper motor neuron begins in the cerebral cortex and ends on the motor nucleus of the facial nerve, while the lower motor neuron arises in the motor nucleus and ends in the muscles.

1. superior salivatory nucleus.
2. nucleus solitarius.
3. terminal part of the upper motor neuron.
4. motor nucleus of facial nerve.
5. motor fibres of the facial nerve (lower motor neuron).

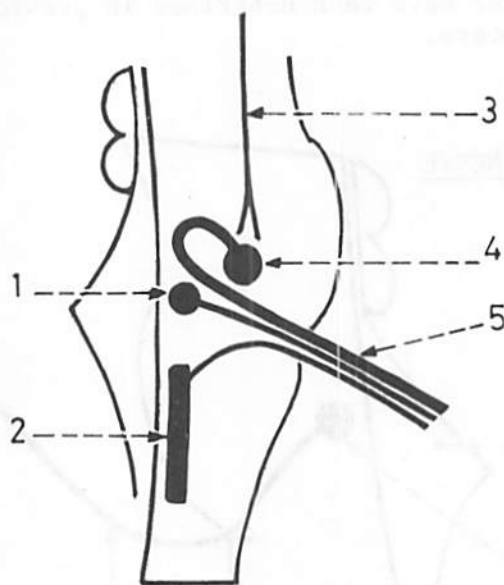
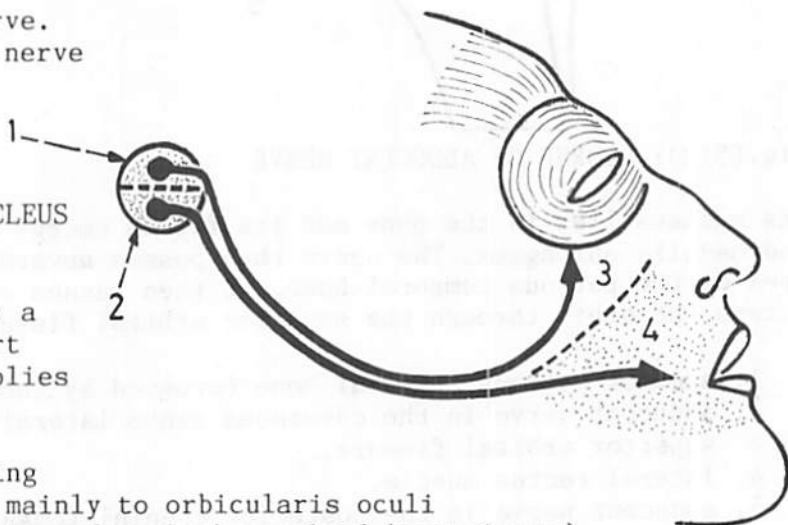


Fig.(515): PARTS OF THE MOTOR NUCLEUS OF THE FACIAL NERVE

This nucleus consists of 2 parts: a part which supplies the upper part of the face and a part which supplies the lower part of the face.

1. part of the nucleus supplying the upper part of the face mainly to orbicularis oculi (receives corticonuclear fibres from both cerebral hemispheres).
2. part of the nucleus supplying the lower part of the face mainly the buccinator (receives corticonuclear fibres from the cerebral hemisphere of the opposite side only).



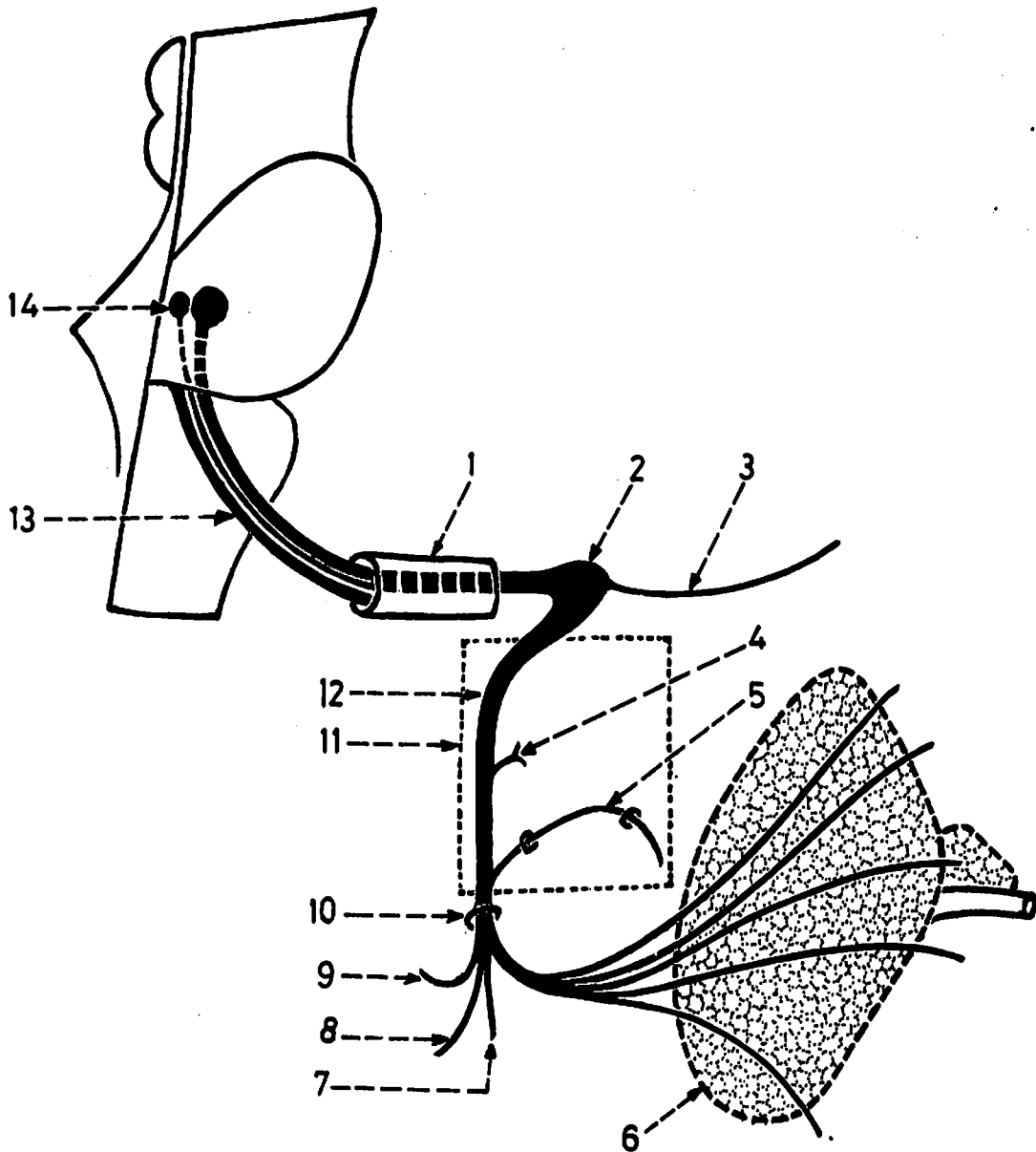


Fig.(516): COURSE AND BRANCHES OF FACIAL NERVE

The nerve emerges on the side of the brain stem at the junction between the pons and medulla oblongata. It runs its course in the internal acoustic meatus and then in the facial canal which lies above the vestibule of the internal ear and in the medial and posterior walls of the middle ear to leave the skull through the stylomastoid foramen. It then enters the parotid gland where it breaks up into its terminal branches.

1. internal acoustic meatus.
2. geniculate ganglion (at the point where the facial canal bends backwards in the medial wall of middle ear).
3. greater petrosal nerve.
4. nerve to stapedius.
5. chorda tympani.
6. parotid gland.
7. branch to stylohyoid.
8. branch to posterior belly of digastric.
9. posterior auricular nerve .
10. stylomastoid foramen.
11. outline of the middle ear.
12. facial nerve in the middle ear.
13. vestibulocochlear nerve accompanying the facial nerve in the posterior cranial fossa.
14. nuclei of facial nerve.

Fig.(517): MUSCLES SUPPLIED BY FACIAL NERVE

These are the muscles of the face and scalp, in addition to the stapedius, stylohyoid, posterior belly of digastric and platysma.

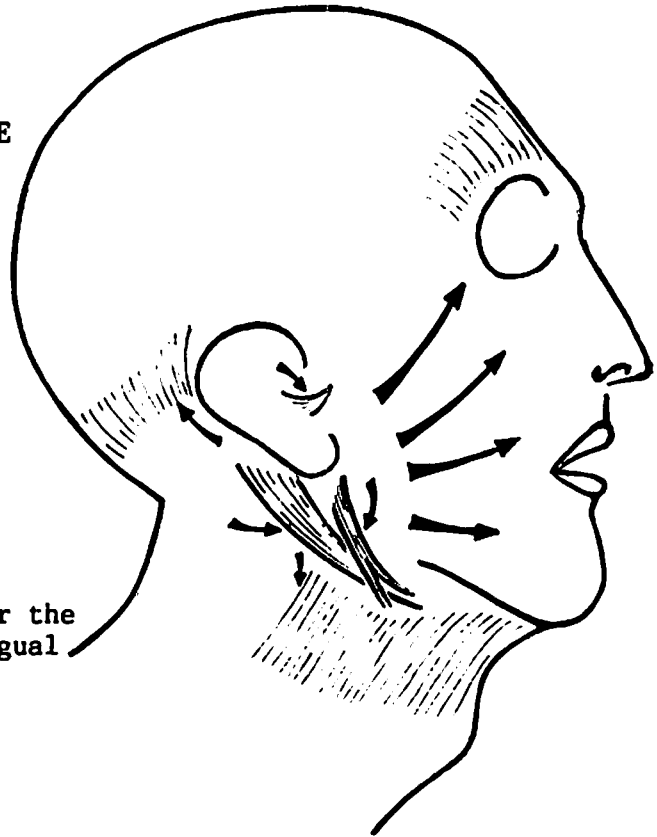
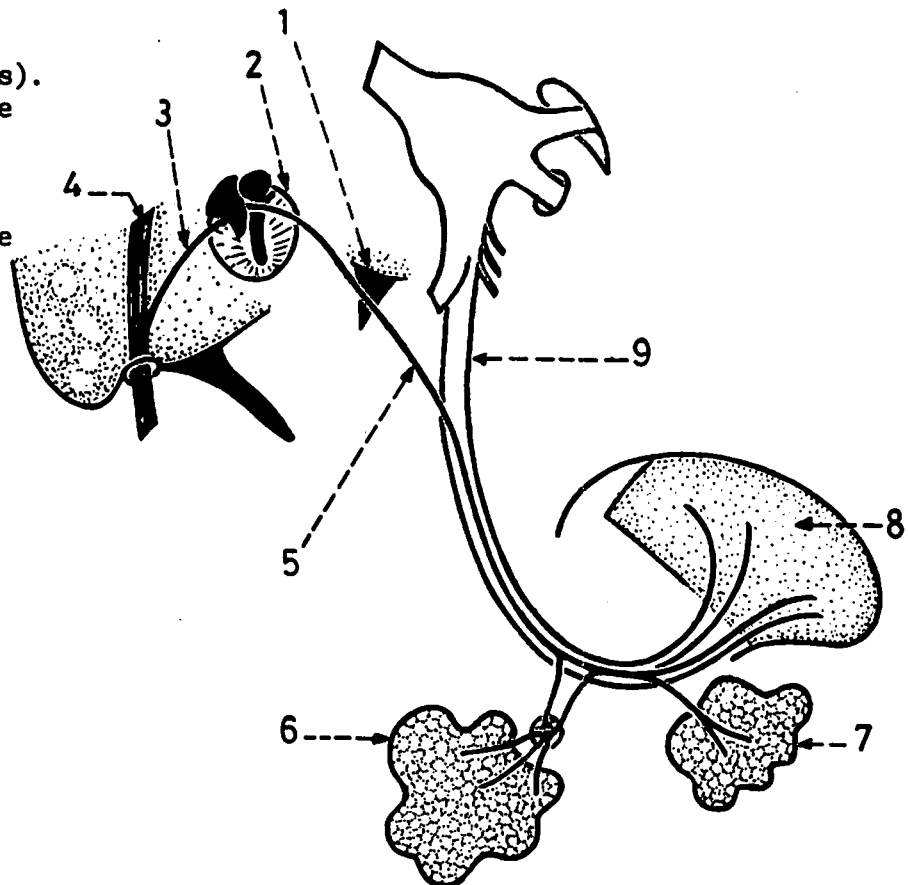


Fig.(518): CHORDA TYMPANI

It arises from the facial nerve in the middle ear 6 mm above the stylomastoid foramen. It leaves the middle ear through the squamotympanic fissure to enter the infratemporal fossa where it joins the lingual nerve at an acute angle. It contains parasympathetic fibres (to the submandibular and sublingual glands) and taste fibres (to the anterior 2/3 of the tongue).

1. spine of sphenoid (just lateral to the nerve).
2. tympanic membrane (here the nerve crosses the medial aspect of the handle of the malleus).
3. chorda tympani in the middle ear.
4. facial nerve as it descends in the posterior wall of the middle ear.
5. chorda tympani as it joins the lingual nerve in the infratemporal fossa.
6. submandibular gland.
7. sublingual gland.
8. anterior 2/3 of the tongue.
9. lingual nerve.







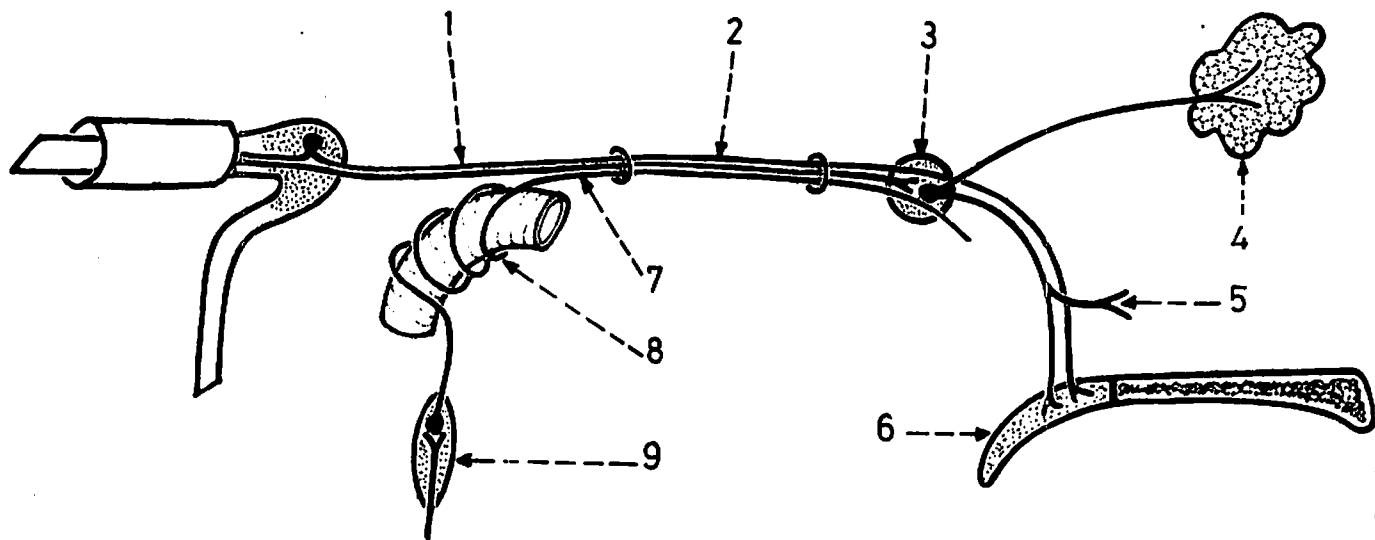


Fig.(520): GREATER PETROSAL NERVE

It arises from the geniculate ganglion and consists of parasympathetic fibres to the pterygopalatine ganglion, and taste fibres from the soft palate.

- |                              |   |
|------------------------------|---|
| 1. greater petrosal nerve.   | 6. soft palate.   |
| 2. nerve of pterygoid canal. | 7. deep petrosal nerve.                                   |
| 3. pterygopalatine ganglion. | 8. sympathetic plexus around the internal carotid artery. |
| 4. lacrimal gland.           | 9. superior cervical sympathetic ganglion.                |
| 5. branch to nasal glands.   |   |

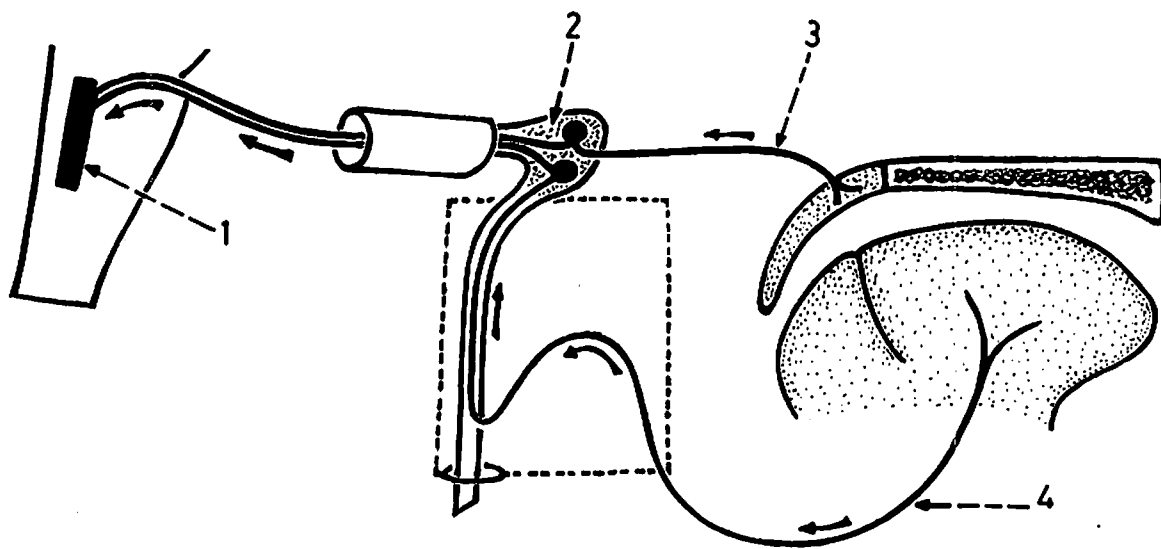


Fig.(521): TASTE FIBRES IN THE FACIAL NERVE

These fibres carry taste sensation from the anterior 2/3 of the tongue (through the chorda tympani) and from the soft palate (through the greater petrosal nerve). Their cells of origin lie in the geniculate ganglion.

- |   |
|---|
| 1. nucleus solitarius (receives all taste fibres).          |
| 2. geniculate ganglion (collection of nerve cells).         |
| 3. greater petrosal nerve supplying the soft palate.        |
| 4. chorda tympani supplying the anterior 2/3 of the tongue. |

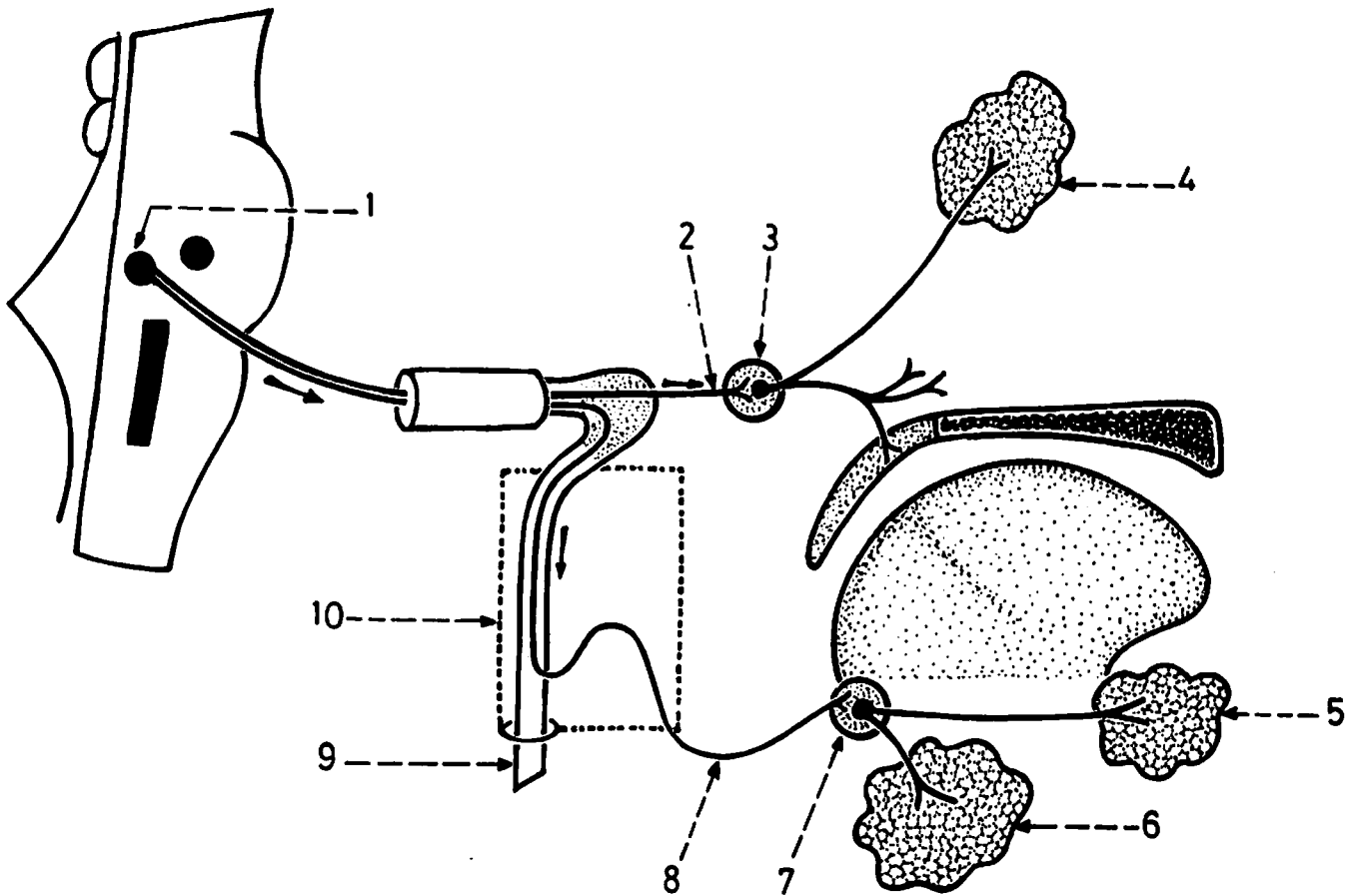


Fig.(522): PARASYMPATHETIC FIBRES IN THE FACIAL NERVE

These fibres arise from the superior salivatory nucleus and are distributed through the chorda tympani (to the submandibular and sublingual glands) and through the greater petrosal nerve (to the lacrimal and nasal glands). The fibres in the chorda tympani relay in the submandibular ganglion, while the fibres in the greater petrosal nerve relay in the pterygopalatine ganglion.

1. superior salivatory nucleus (parasympathetic nucleus present in the pons).
2. greater petrosal nerve.
3. pterygopalatine ganglion (in the pterygopalatine fossa).
4. lacrimal gland.
5. sublingual gland.
6. submandibular gland.
7. submandibular ganglion (in the submandibular region).
8. chorda tympani.
9. facial nerve.
10. middle ear.

\* It should be noted that the taste and parasympathetic fibres in the facial nerve are grouped together to form the nervus intermedius. This nervus intermedius runs as a separate bundle between the facial nerve and the vestibulo-cochlear nerve in the posterior cranial fossa.

Fig.(523): SURFACE ANATOMY OF FACIAL NERVE IN THE PAROTID GLAND

It is represented by a horizontal line drawn across the lobule of the ear from a point at the middle of the anterior border of the mastoid process.

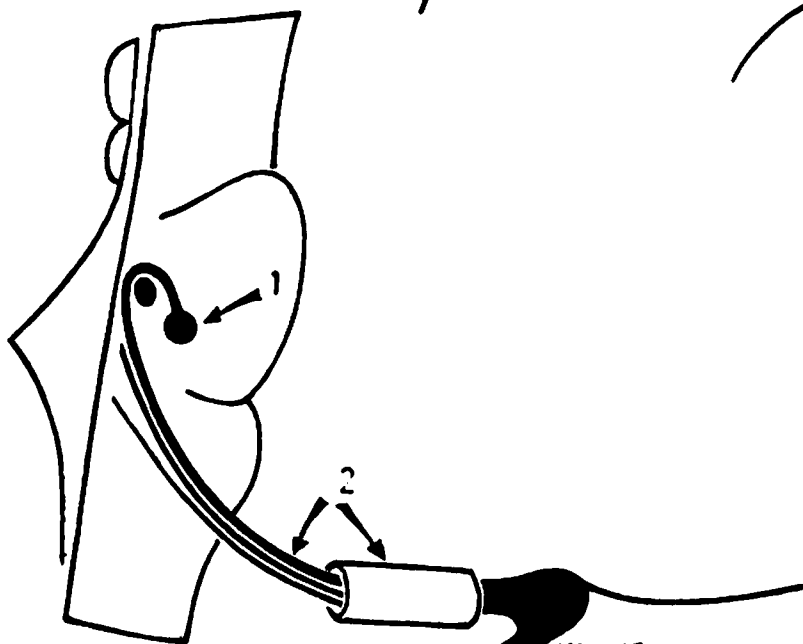
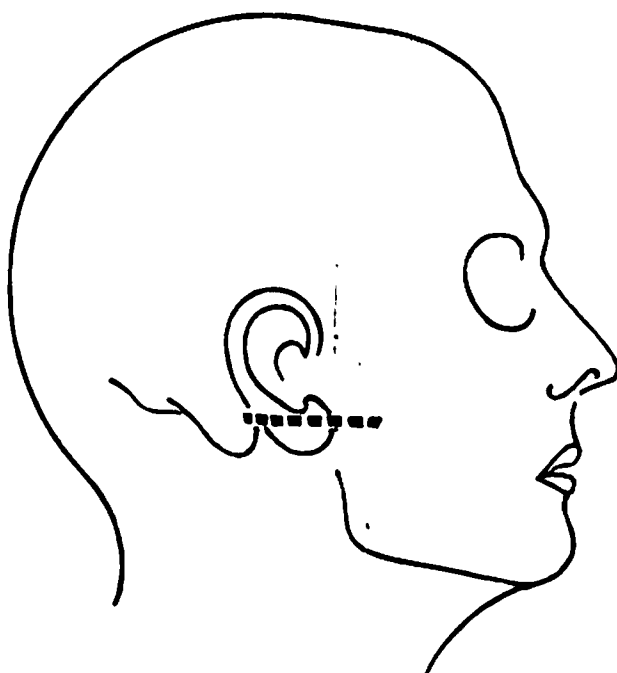
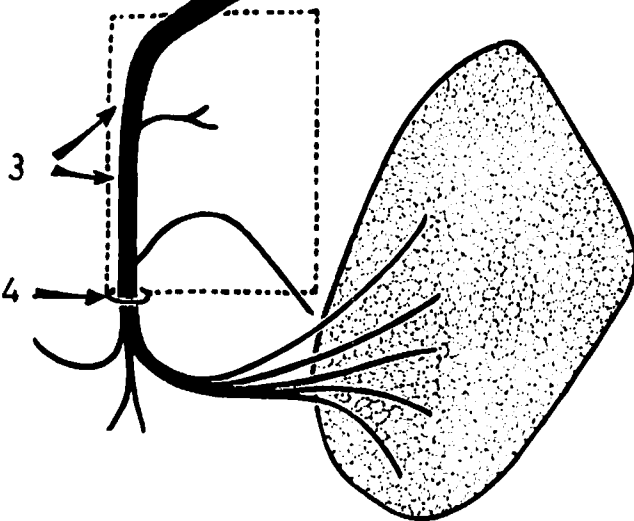


Fig.(524): SITES OF LESIONS OF FACIAL NERVE

1. lesion to the motor nucleus: leads to paralysis of muscles supplied by facial nerve (no affection of taste or parasympathetic function ).
2. lesion in the posterior cranial fossa including the internal acoustic meatus: here the vestibulo-cochlear nerve is also injured leading to deafness. All fibres of the facial nerve (motor, parasympathetic and taste) are interrupted.
3. lesion in the middle ear: leads to paralysis of all muscles supplied by the nerve and loss of taste sensation from the anterior 2/3 of the tongue in addition to the parasympathetic supply to the submandibular and sublingual glands.
4. lesion at the stylomastoid foramen (Bell's palsy): leads to paralysis of all muscles supplied by the nerve except the stapedius. Neither taste nor parasympathetic function is affected.



VESTIBULOCOCHLEAR NERVE

Fig.(525): PARTS OF VESTIBULO-COCHLEAR NERVE

It consists of a cochlear part for hearing and a vestibular part for equilibrium.

1. cochlear division (arises from the cochlea).
2. cochlea (contains spiral ganglion).
3. semicircular canals.
4. vestibular division (arises from the semicircular canals).
5. vestibular ganglion in the bottom of the internal acoustic meatus.
6. vestibulocochlear nerve.
7. nervus intermedius.
8. facial nerve.

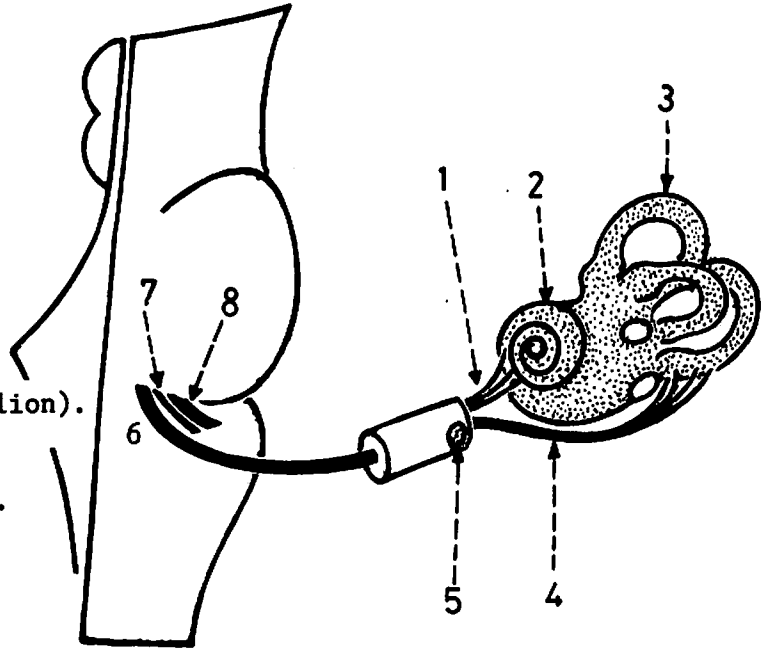
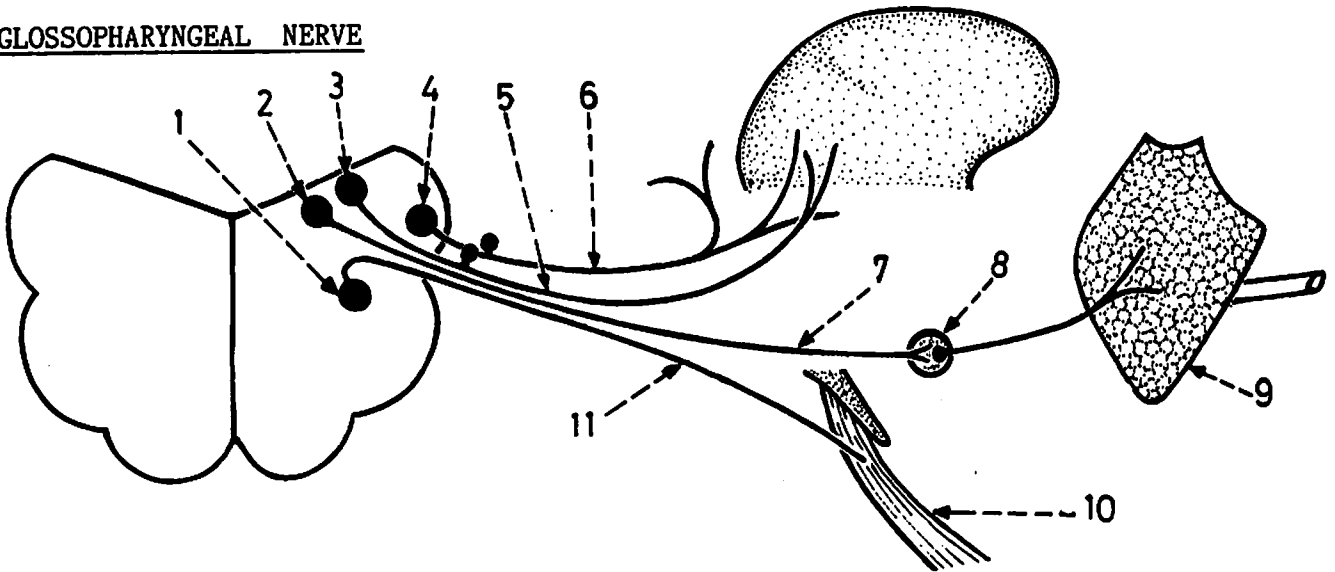
GLOSSOPHARYNGEAL NERVE

Fig.(526): NUCLEI AND TYPES OF FIBRES OF GLOSSOPHARYNGEAL NERVE

The nerve has 4 nuclei: nucleus ambiguus (motor), inferior salivatory nucleus (parasympathetic), nucleus solitarius (for taste) and spinal nucleus of trigeminal nerve (for general sensations). All these nuclei lie in the medulla oblongata.

- |   |   |
|---|---|
| 1. nucleus ambiguus (motor).                                    | 6. fibres carrying general sensations from the pharynx and posterior 1/3 of tongue. |
| 2. inferior salivatory nucleus (parasympathetic to parotid).    | 7. parasympathetic fibres (to the parotid).   |
| 3. nucleus solitarius (for taste).                              | 8. otic ganglion.   |
| 4. spinal nucleus of trigeminal nerve (for general sensations). | 9. parotid gland.   |
| 5. taste fibres from posterior 1/3 of the tongue.               | 10. stylopharyngeus muscle.   |
|   | 11. motor fibres.   |

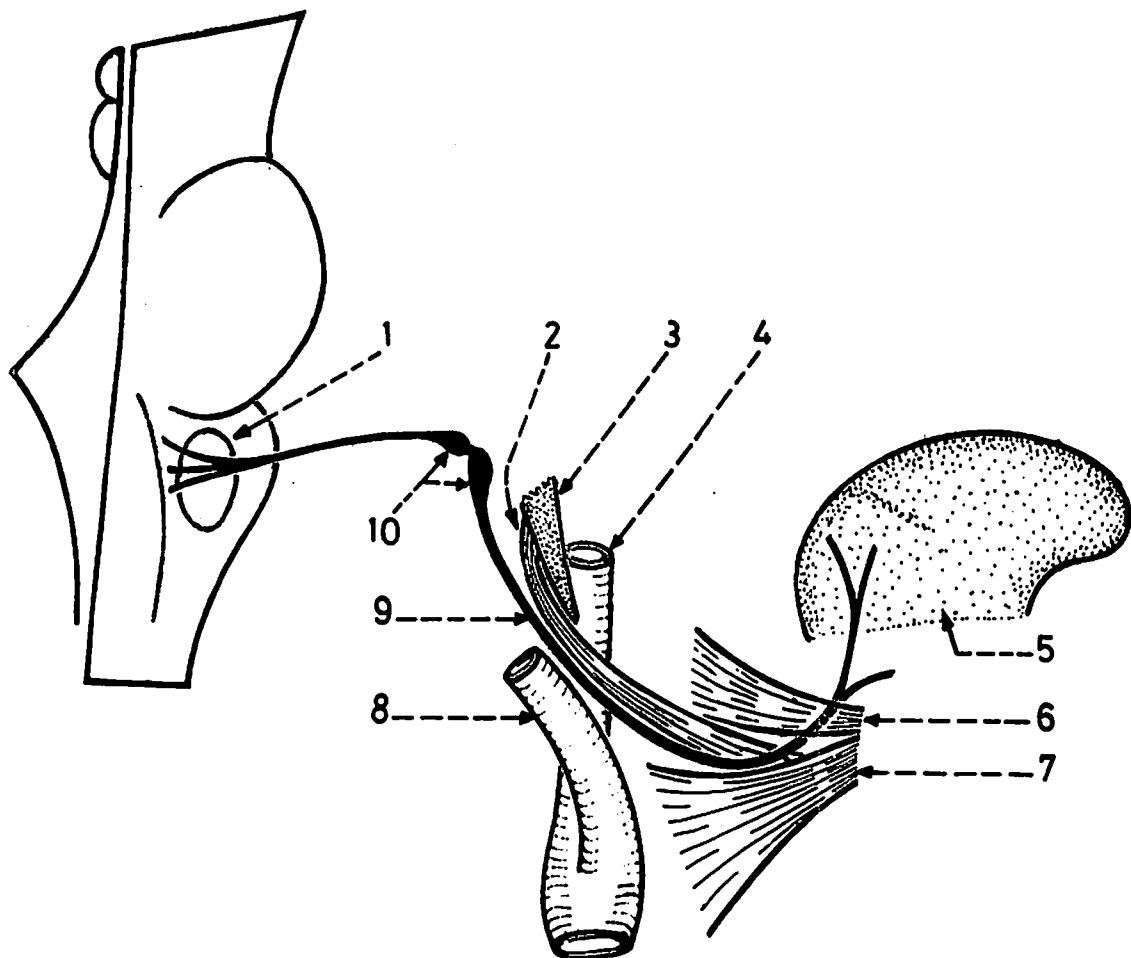


Fig.(527): COURSE OF GLOSSOPHARYNGEAL NERVE

It is attached to the side of the medulla oblongata and leaves the cranial cavity through the jugular foramen. In the foramen, the nerve has 2 small ganglia (superior and inferior). In the neck it descends superficial to internal carotid artery and curves forwards to lie on the stylopharyngeus muscle. It enters the pharynx between the superior and middle constrictors to be distributed to the mucous membrane of the pharynx, tonsil and posterior 1/3 of tongue.

1. medulla oblongata.
2. stylopharyngeus muscle (the only pharyngeal muscle supplied by the glossopharyngeal nerve).
3. styloid process.
4. internal carotid artery.
5. posterior 1/3 of the tongue.
6. superior constrictor of the pharynx.
7. middle constrictor of the pharynx.
8. external carotid artery.
9. glossopharyngeal nerve (accompanies the stylopharyngeus muscle and pass together between the superior and middle constrictors).
10. superior and inferior ganglia of glossopharyngeal nerve (contains cells concerned with taste and general sensations).

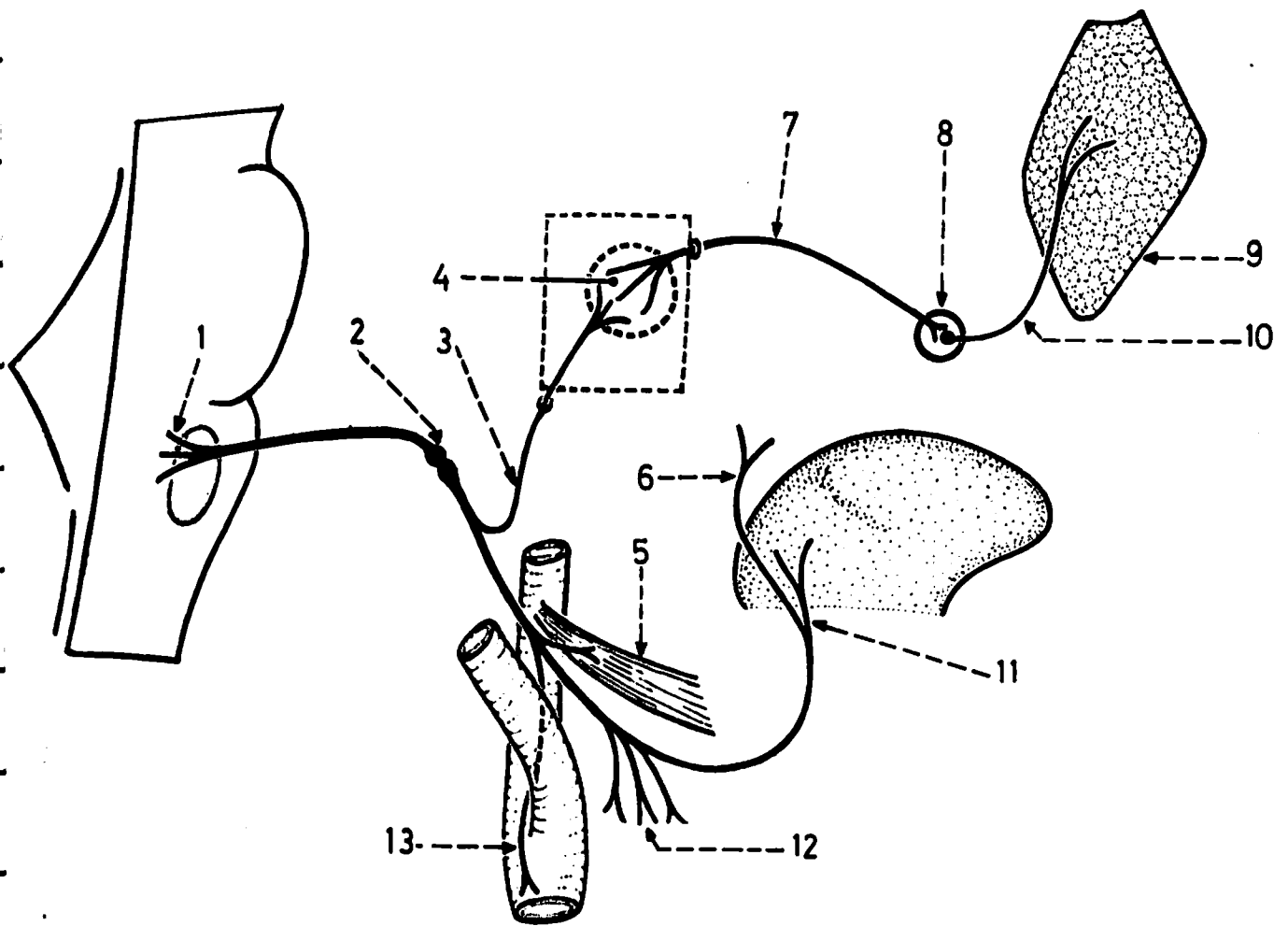


Fig.(528): BRANCHES OF GLOSSOPHARYNGEAL NERVE

— These are tympanic, carotid, pharyngeal, muscular and terminal branches to the tonsil and tongue.

1. rootlets of origin of the glossopharyngeal nerve.
2. superior and inferior ganglia of the glossopharyngeal nerve.
3. tympanic branch (enters the tympanic cavity where it divides to form the tympanic plexus).
4. tympanic plexus on the surface of the promontory (on the medial wall of the middle ear).
5. stylopharyngeus muscle (the only muscle supplied by the nerve).
6. branches to the tonsil.
7. lesser petrosal nerve (contains parasympathetic fibres to the parotid gland and leaves the middle ear through a hiatus on the anterior surface of the petrous bone).
8. otic ganglion.
9. parotid gland.
10. postganglionic fibres from the otic ganglion to the parotid gland.
11. branches to the posterior 1/3 of the tongue.
12. pharyngeal branches which join the pharyngeal plexus on the surface of the middle constrictor (sensory).
13. carotid nerve (descends on the internal carotid artery to reach the carotid sinus and carotid body).

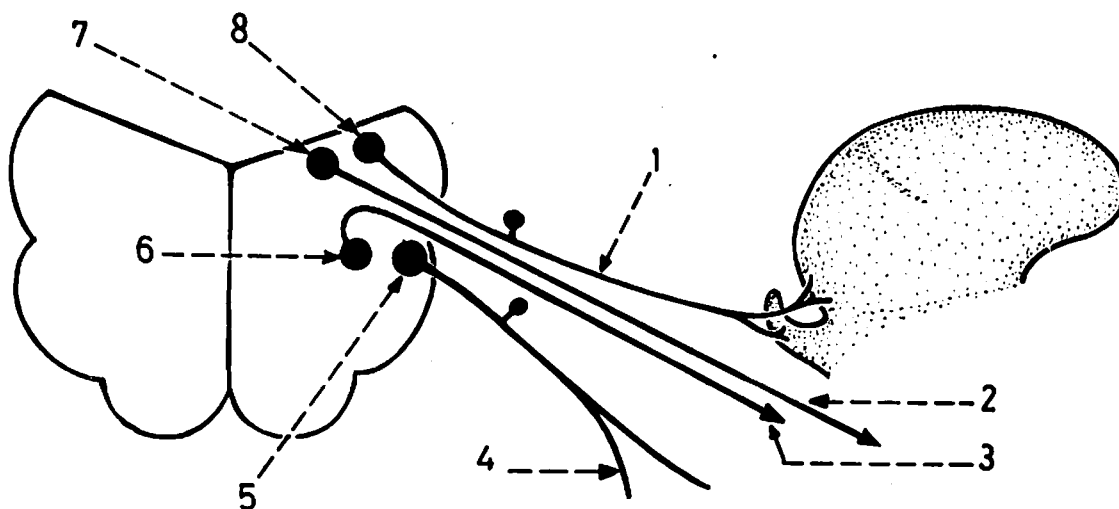
VAGUS NERVE

Fig.(529): NUCLEI AND TYPES OF FIBRES OF VAGUS NERVE

The vagus has 4 nuclei: nucleus ambiguus (motor), dorsal nucleus of vagus (parasympathetic), nucleus solitarius (for taste) and spinal nucleus of trigeminal nerve (for general sensations).

1. taste fibres from epiglottis and most posterior part of the tongue.
2. parasympathetic fibres.
3. motor fibres.
4. fibres carrying general sensations from the larynx.
5. spinal nucleus of trigeminal nerve. (for general sensations).
6. nucleus ambiguus (motor).
7. dorsal nucleus of vagus (parasympathetic).
8. nucleus solitarius (for taste).

Fig.(530): COURSE OF VAGUS NERVE IN THE NECK

After passing through the jugular foramen, the vagus runs vertically downwards in the carotid sheath between the internal jugular vein laterally and both the internal and common carotid arteries medially.

1. vagus nerve.
2. branch to the carotid body.
3. internal jugular vein.
4. right subclavian artery (behind the vagus).
5. internal carotid artery.
6. pharyngeal branch to the pharyngeal plexus.
7. internal and external laryngeal nerves.
8. right recurrent laryngeal nerve.
9. common carotid artery.

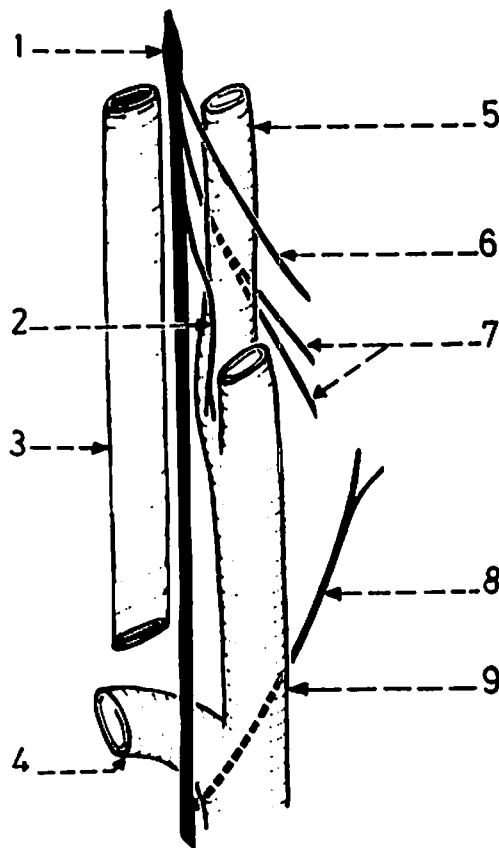
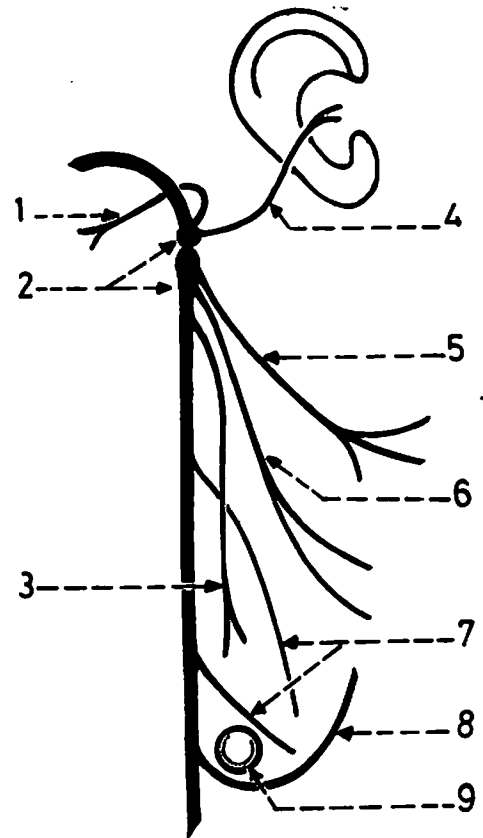




Fig.(531): BRANCHES OF VAGUS NERVE IN THE NECK

These are meningeal, auricular, pharyngeal, branch to carotid body, superior laryngeal, cardiac and recurrent laryngeal on the right side.

1. meningeal branch (to the dura mater of posterior cranial fossa).
2. superior and inferior ganglia of the vagus.
3. branch to the carotid body.
4. auricular branch (to part of the skin of the auricle and external acoustic meatus).
5. pharyngeal branch to the pharyngeal plexus (motor).
6. superior laryngeal nerve (to the larynx).
7. cardiac branches (to the heart).
8. right recurrent laryngeal nerve (to the larynx).
9. right subclavian artery.

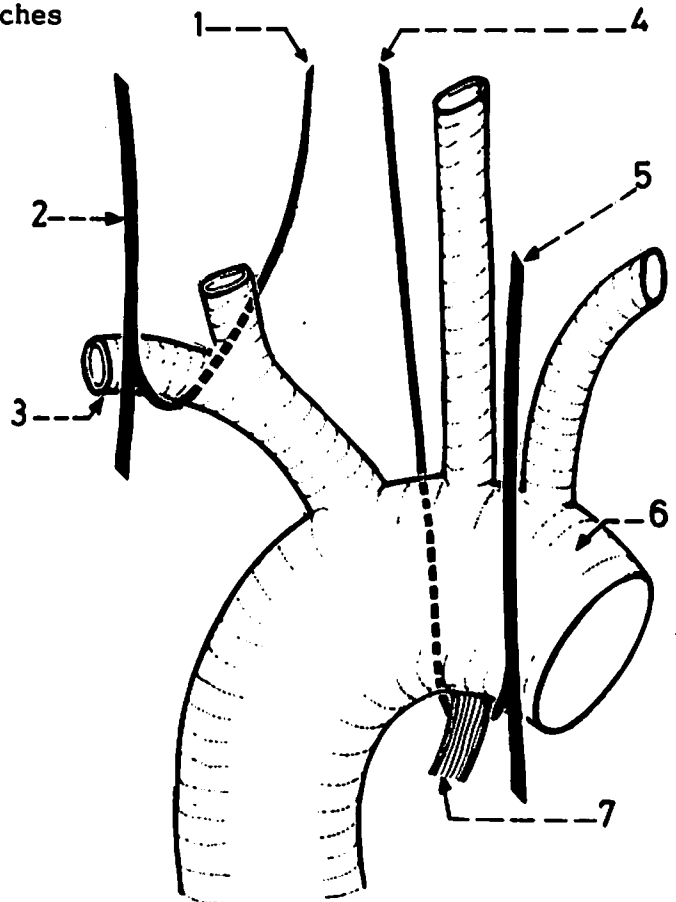


\* The pharyngeal plexus of nerves lies on the surface of middle constrictor and consists of the pharyngeal branch of the vagus (motor), pharyngeal branches of the glossopharyngeal (sensory) and sympathetic fibres.

Fig.(532): RECURRENT LARYNGEAL NERVES ON BOTH SIDES

The right nerve arises in the root of the neck and winds round the right subclavian artery, while the left nerve arises in the chest and winds round the arch of the aorta.

1. right recurrent laryngeal nerve.
2. right vagus nerve.
3. right subclavian artery.
4. left recurrent laryngeal nerve.
5. left vagus nerve.
6. arch of the aorta.
7. ligamentum arteriosum.



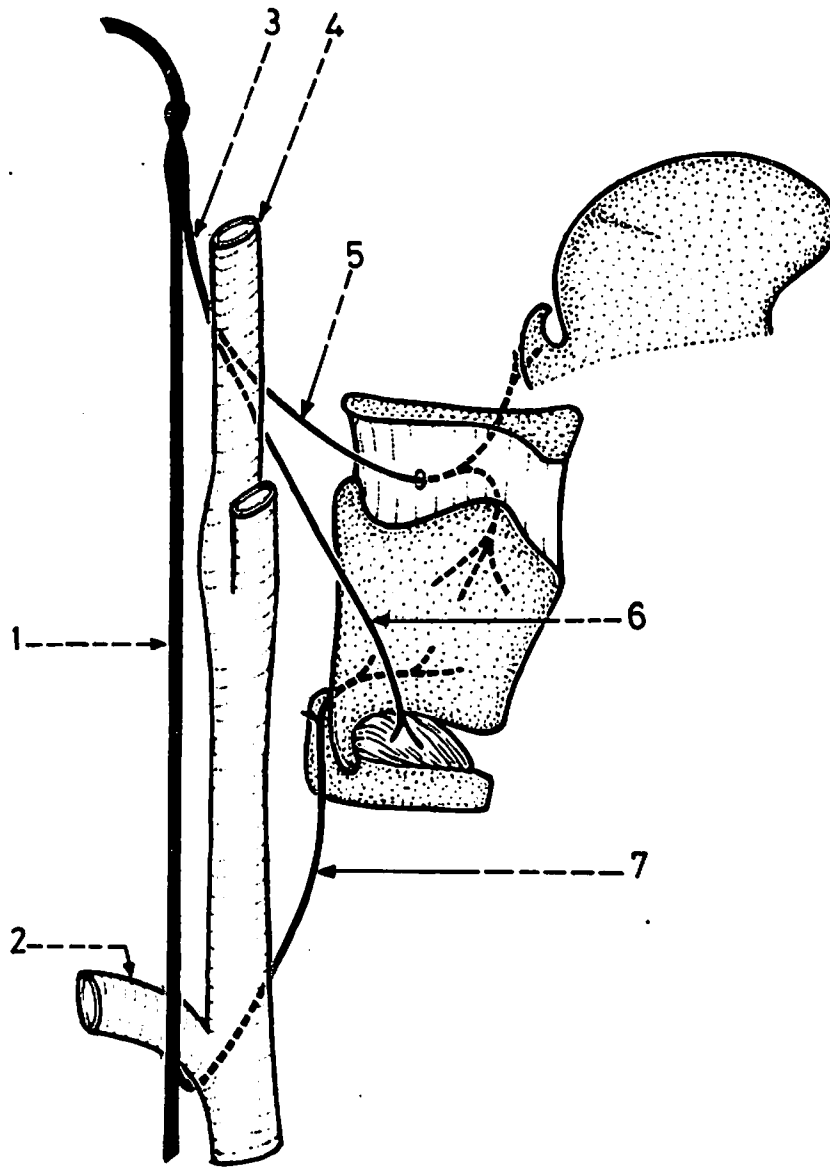


Fig.(533): SUPERIOR AND RECURRENT LARYNGEAL NERVES

The superior laryngeal nerve arises from the vagus nerve close to the jugular foramen and descends deep to the internal carotid artery where it divides into internal and external laryngeal branches. The internal laryngeal nerve pierces the thyrohyoid membrane to enter the larynx. The external laryngeal nerve supplies the cricothyroid muscle.

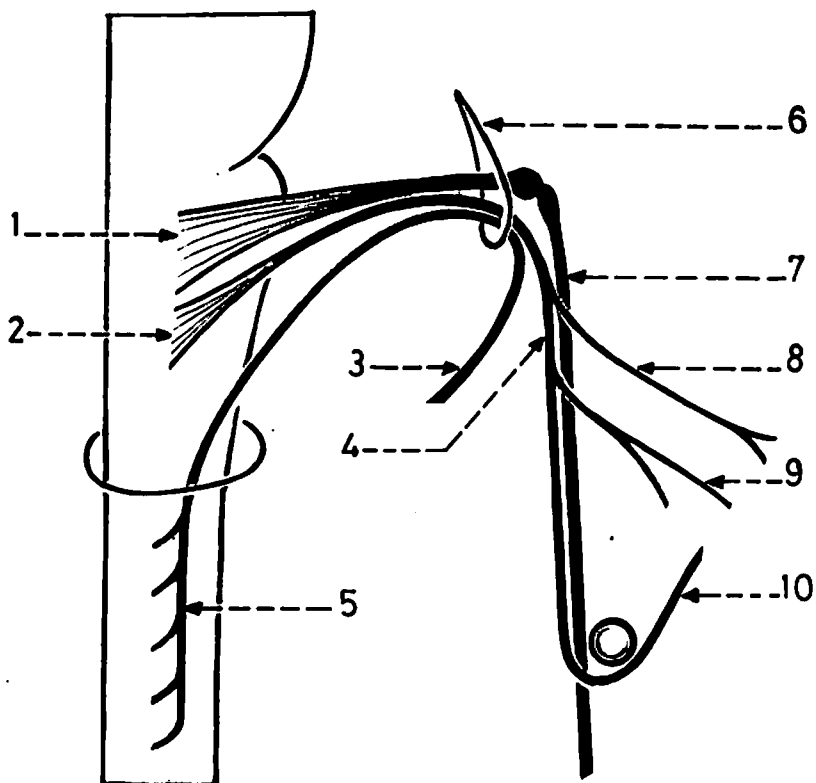
The recurrent laryngeal nerve enters the larynx from below.

1. right vagus nerve.
2. right subclavian artery.
3. superior laryngeal nerve.
4. internal carotid artery.
5. internal laryngeal nerve (sensory to the larynx above the vocal cords).
6. external laryngeal nerve (motor to the cricothyroid muscle).
7. right recurrent laryngeal nerve (supplies all the intrinsic muscles of the larynx except the cricothyroid, and is sensory to the larynx below the vocal cords).

ACCESSORY NERVE

Fig.(534): ROOTS OF THE ACCESSORY NERVE

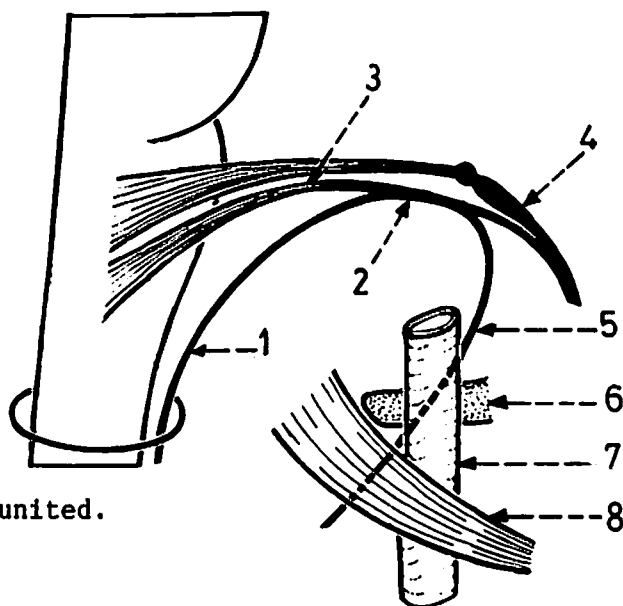
The nerve has 2 roots: a cranial root which arises from the nucleus ambiguus in the medulla oblongata, and a spinal root which arises from the upper 5 cervical segments of the spinal cord. The 2 roots join each other in the jugular foramen then separate again just below the foramen. The cranial root joins the vagus nerve while the spinal root passes downwards and backwards to reach the side of the neck.



1. vagus nerve.
2. cranial root of accessory nerve.
3. spinal root of accessory nerve.
4. cranial root joining the vagus nerve to be distributed through its laryngeal and pharyngeal branches.
5. origin of spinal root.
6. jugular foramen.
7. vagus nerve.
8. pharyngeal branch of vagus.
9. superior laryngeal branch of vagus.
10. recurrent laryngeal branch of vagus.

Fig.(535): SPINAL ROOT OF ACCESSORY NERVE

It enters the cranial cavity through the foramen magnum to join the cranial root for a short distance. Below the jugular foramen, it separates and runs downwards and backwards deep to the internal jugular vein and the posterior belly of digastric.



1. spinal root in the cranial cavity.
2. the accessory nerve with its 2 roots united.
3. cranial root.
4. vagus nerve.
5. spinal root separated.
6. transverse process of atlas vertebra.
7. internal jugular vein.
8. posterior belly of digastric.

Fig.(536): SPINAL ROOT OF ACCESSORY NERVE IN THE POSTERIOR TRIANGLE

The nerve pierces the deep surface of the sternomastoid to emerge at the middle of its posterior border. It then crosses the posterior triangle to disappear under cover of the trapezius 5 cm above the clavicle. In the posterior triangle it lies on the levator scapulae and is related to few superficial cervical lymph nodes.

1. levator scapulae in the posterior triangle.
2. superficial cervical lymph node alongside the accessory nerve.
3. trapezius muscle.
4. spinal root of accessory.
5. sternomastoid.

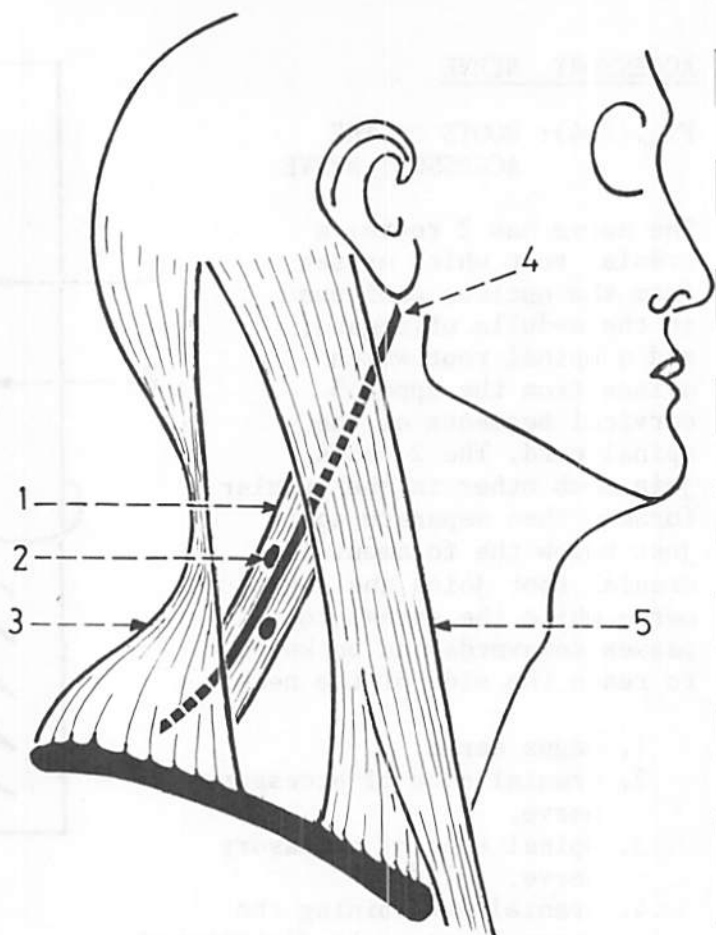
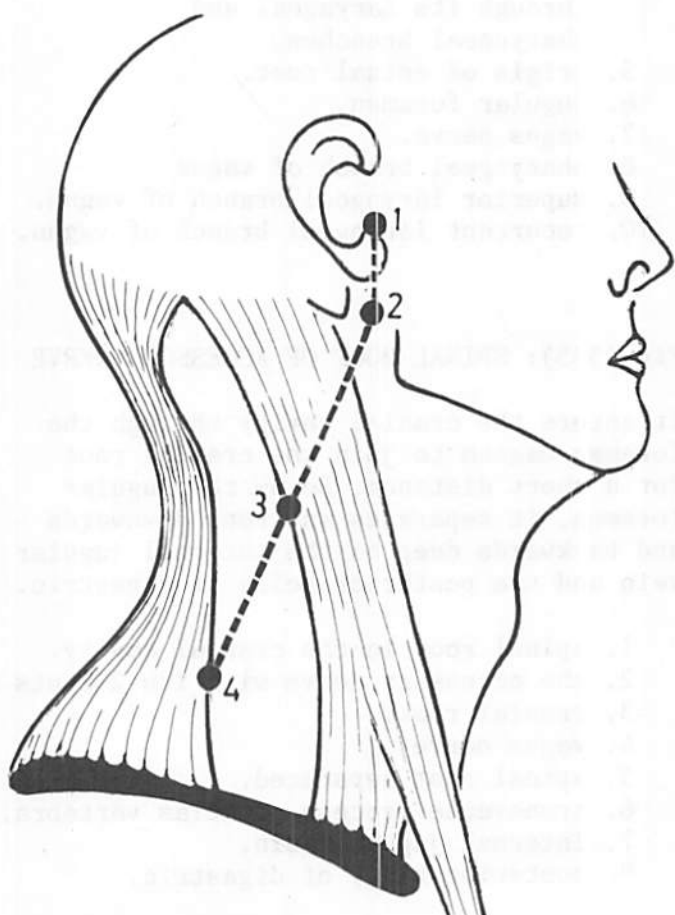


Fig.(537): SURFACE ANATOMY OF THE SPINAL ROOT OF ACCESSORY NERVE

It corresponds to a line drawn on the side of the neck passing through the following points:

- Point (1): at the tragus of the ear.
- Point (2): at the tip of the transverse process of atlas vertebra.
- Point (3): at the middle of the posterior border of the sternomastoid.
- Point (4): on the anterior border of the trapezius 5 cm above the clavicle.



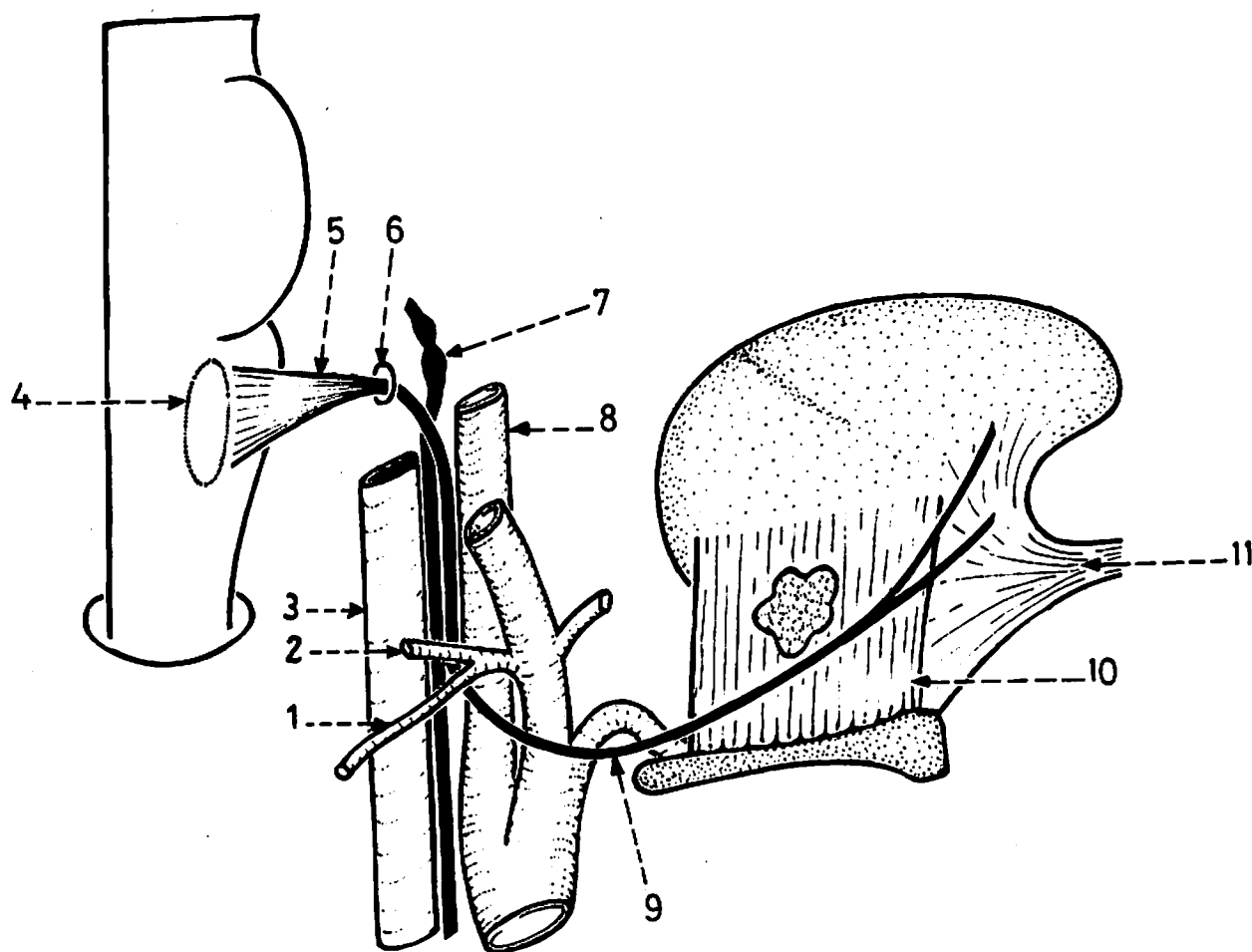
HYPOGLOSSAL NERVE

Fig.(538): COURSE OF HYPOGLOSSAL NERVE

It arises from the side of the medulla oblongata by a number of rootlets. It leaves the skull through the hypoglossal canal and then runs downwards between the internal jugular vein and internal carotid artery in front of the vagus nerve. Just below the posterior belly of digastric the nerve curves forwards round the origin of the occipital artery, and here it crosses over 3 arteries (internal carotid artery, external carotid artery and loop of lingual artery). It continues forwards on the surface of the hyoglossus a little above the greater cornu of the hyoid bone to disappear into the substance of the genioglossus muscle.

- |  |   |
|--|---|
| 1. sternomastoid branch of occipital artery. | 7. vagus nerve.   |
| 2. occipital artery.                         | 8. internal carotid artery.   |
| 3. internal jugular vein.                    | 9. hypoglossal nerve crossing over the internal carotid, external carotid and the loop of lingual artery. |
| 4. side of medulla oblongata.                | 10. hyoglossus muscle.  |
| 5. rootlets of origin of hypoglossal nerve.  | 11. genioglossus muscle.  |
| 6. hypoglossal canal.                        |   |

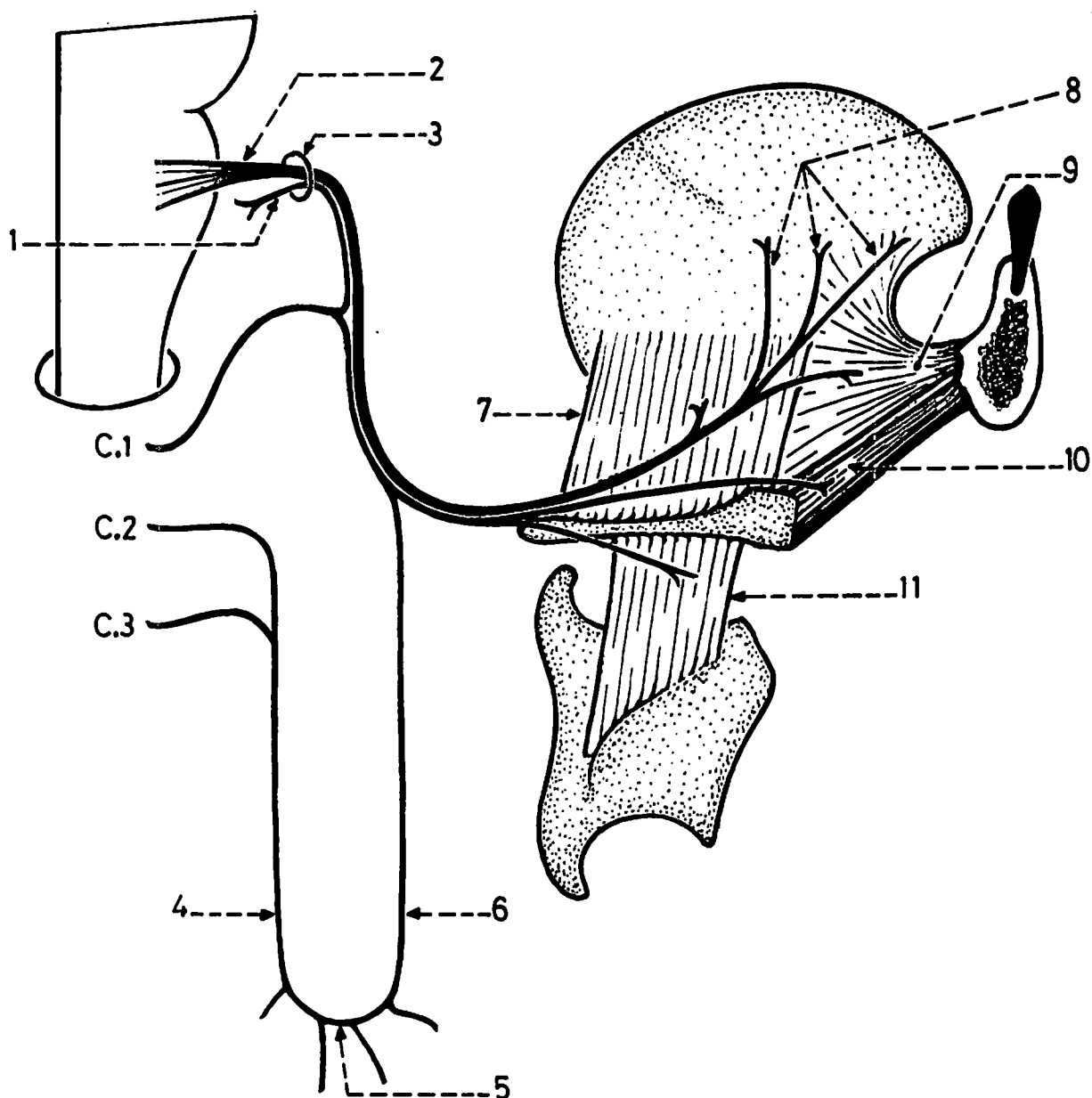


Fig.(539): BRANCHES OF HYPOGLOSSAL NERVE

These are meningeal, descendens hypoglossi and muscular branches to the thyrohyoid, geniohyoid and all glossus muscles except the palatoglossus. The hypoglossal nerve receives fibres from first cervical nerve.

1. meningeal branch to the dura mater.
2. rootlets of origin of the hypoglossal nerve (arising from hypoglossal nucleus).
3. hypoglossal canal.
4. descendens cervicalis (from C.2,3).
5. ansa cervicalis (a loop formed by descendens hypoglossi and descendens cervicalis; it supplies the infrahyoid muscles by C.1,2,3).
6. descendens hypoglossi (C.1).
7. hyoglossus muscle.
8. terminal branches to muscles of the tongue.
9. genioglossus muscle.
10. geniohyoid muscle.
11. thyrohyoid muscle.

## CERVICAL PLEXUS

Fig.(540): FORMATION OF THE  
CERVICAL PLEXUS

It is formed by the ventral rami of the upper 4 cervical nerves. These nerves unite together to form 3 loops close to the transverse processes of the upper 4 cervical vertebrae and under cover of the internal jugular vein.

1. internal jugular vein.
2. the 3 loops of the plexus joining the upper 4 cervical nerves.

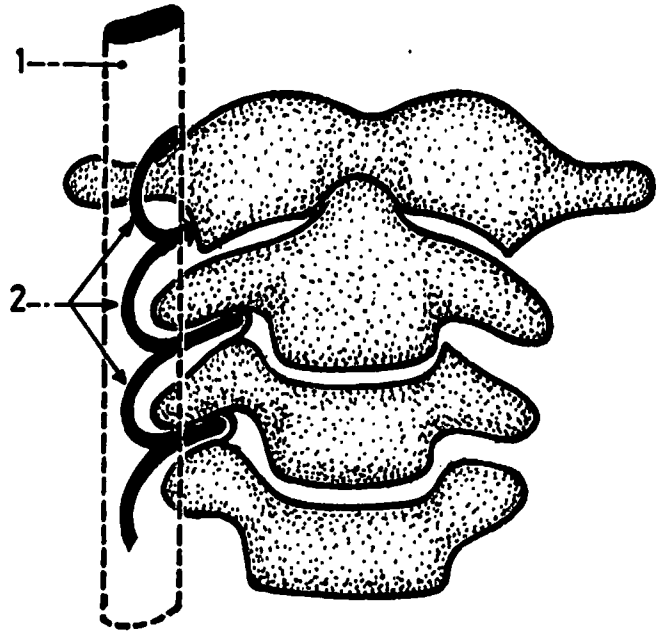


Fig.(541): COURSE OF THE VENTRAL RAMUS  
OF 1st CERVICAL NERVE

It runs above the posterior arch of the atlas medial to the 3rd part of the vertebral artery. It then descends in front of the transverse process of the atlas to join the cervical plexus.

1. ventral ramus of 1st cervical nerve.
2. vertebral artery.

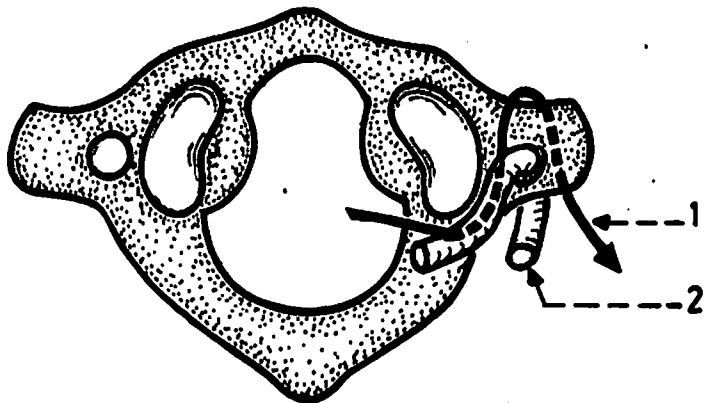


Fig.(542): CUTANEOUS BRANCHES OF THE CERVICAL PLEXUS

These are the lesser occipital, great auricular, transverse cutaneous nerve of the neck and the 3 supraclavicular nerves (lateral, intermediate and medial).

1. lesser occipital nerve (C.2): ascends along the posterior border of the sternomastoid.
2. great auricular nerve (C.2,3): ascends on the upper part of the sternomastoid in company with the external jugular vein as far as the skin over the parotid gland.
3. transverse cutaneous nerve of the neck (C.2,3): runs forwards across the sternomastoid about its middle.
4. lateral supraclavicular nerve (C.3,4): crosses the lateral part of the clavicle.
5. intermediate supraclavicular nerve (C.3,4): crosses the middle of the clavicle.
6. medial supraclavicular nerve (C.3,4): crosses the medial part of the clavicle.

\* All the above cutaneous branches appear at the middle of the posterior border of the sternomastoid.

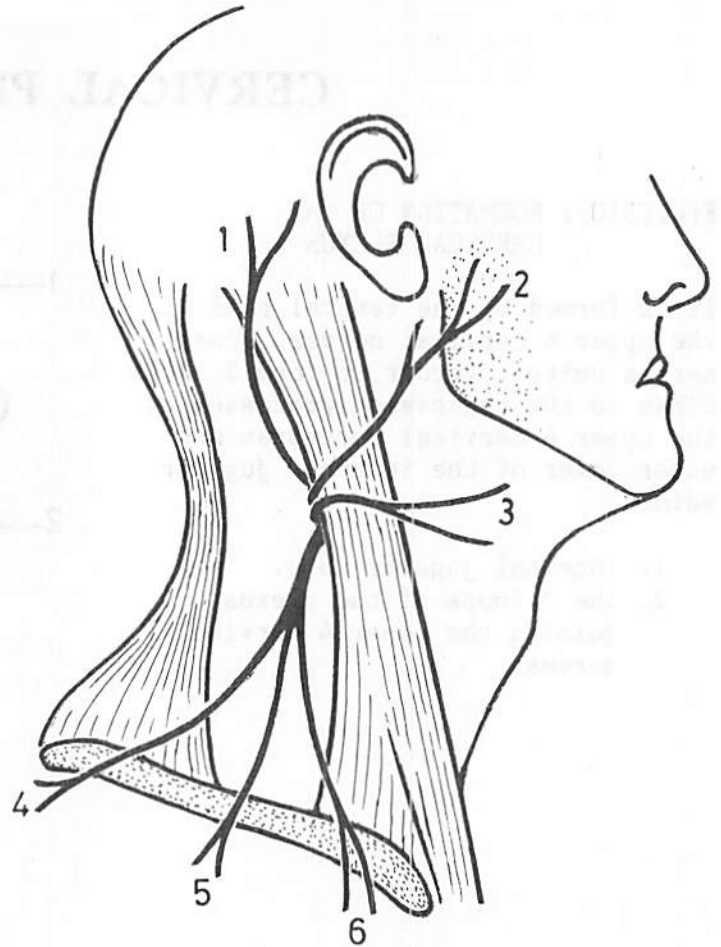
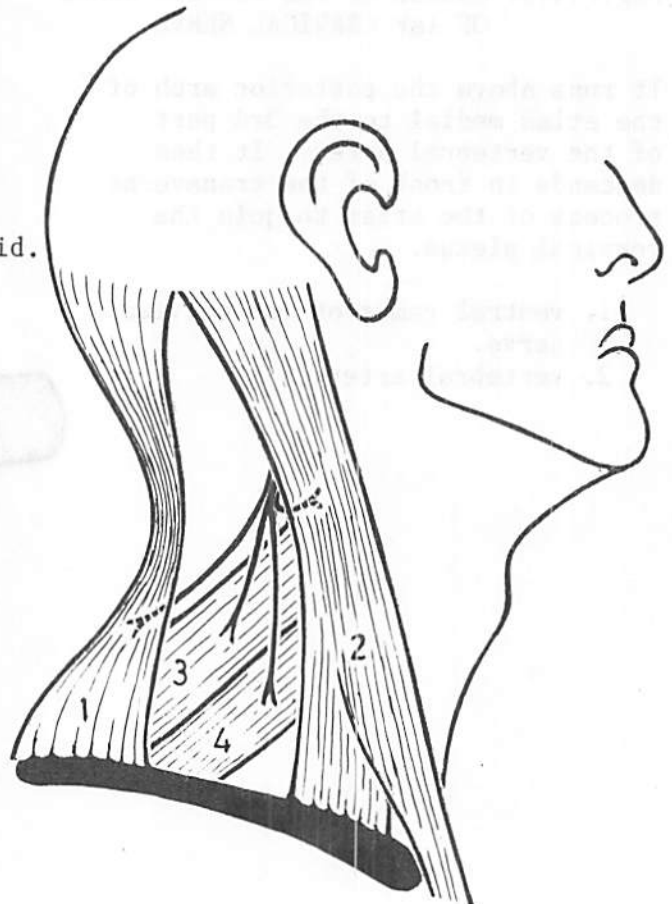


Fig.(543): MUSCULAR BRANCHES OF THE CERVICAL PLEXUS

The plexus gives direct muscular branches to the sternomastoid, trapezius, levator scapulae, scalenus medius and prevertebral muscles. In addition, it supplies the diaphragm through the phrenic nerve and the infrahyoid muscles through the ansa cervicalis.

1. trapezius.
2. sternomastoid.
3. levator scapulae.
4. scalenus medius.





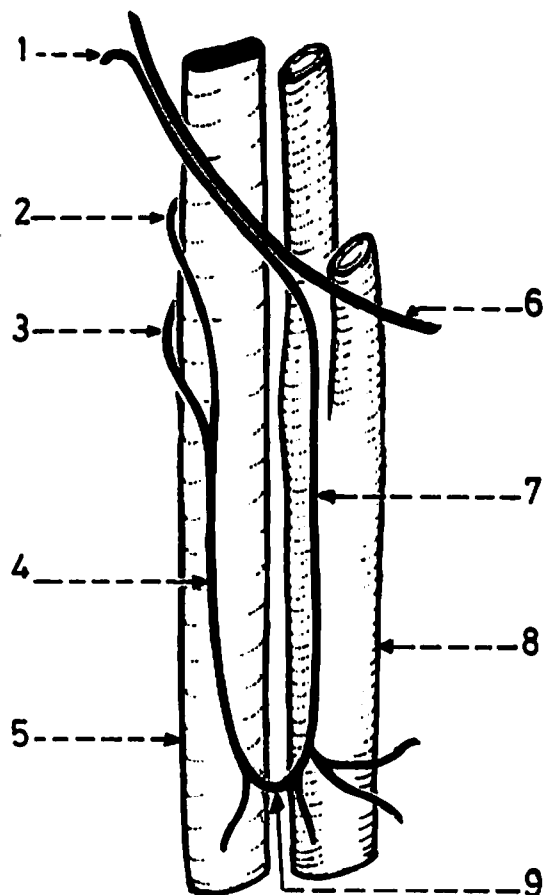


Fig.(544): ANSA CERVICALIS

It is a loop of nerve fibres situated in front of the carotid sheath at the middle of the neck. It has a superior root (descendens hypoglossi) and an inferior root (descendens cervicalis).

1. fibres from C.1 joining the hypoglossal nerve.
2. fibres from C.2.
3. fibres from C.3.
4. descendens cervicalis (C.2,3).
5. internal jugular vein.
6. hypoglossal nerve.
7. descendens hypoglossi (C.1).
8. common carotid artery.
9. ansa cervicalis (C.1,2,3).

\* The ansa cervicalis supplies all infrahyoid muscles except the thyrohyoid.

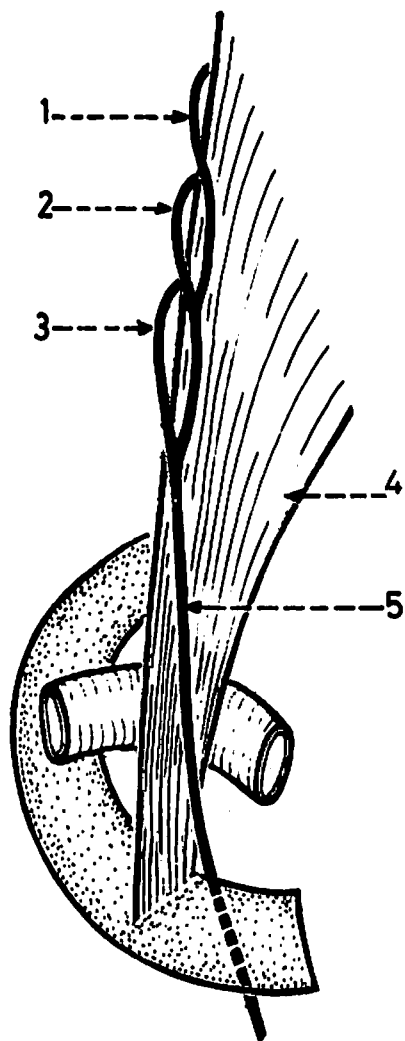


Fig.(545): PHRENIC NERVE IN THE NECK

It is formed from C.3,4,5 and descends on the front of the scalenus anterior muscle to enter the chest.

1. root from C.3.
2. root from C.4.
3. root from C.5.
4. scalenus anterior muscle.
5. phrenic nerve.

## CERVICAL SYMPATHETIC TRUNK

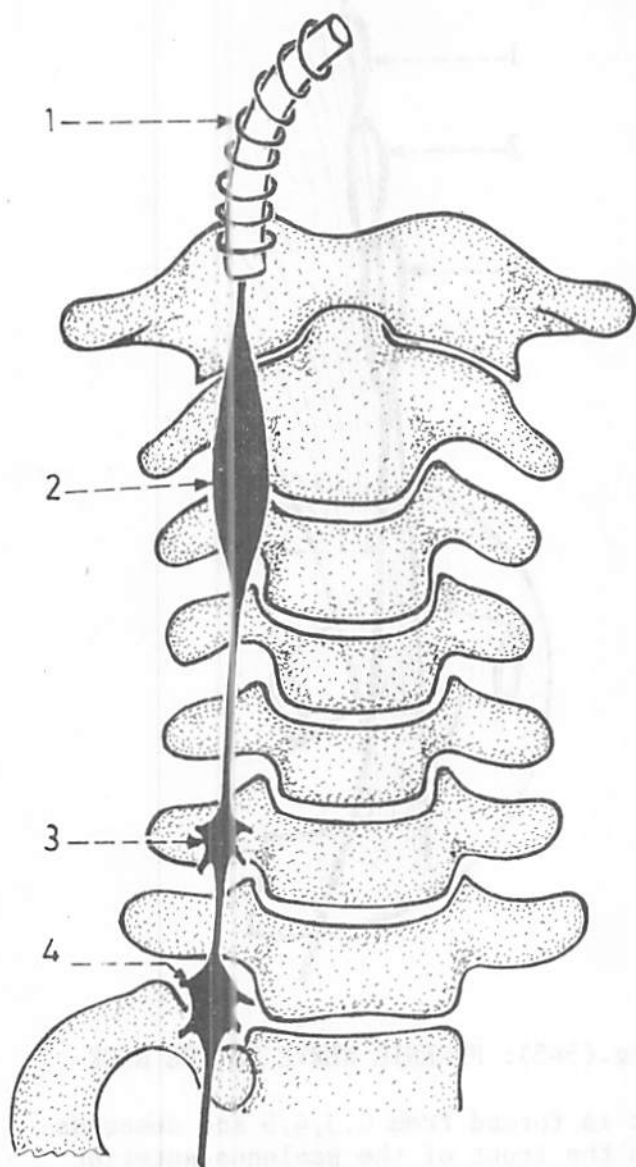


Fig.(546): POSITION OF SYMPATHETIC TRUNK IN THE NECK

It extends vertically from the base of the skull to the root of the neck. It lies in front of the transverse processes of the cervical vertebrae and behind the carotid sheath. It consists of 3 ganglia (superior, middle and inferior).

1. plexus around the internal carotid artery.
2. superior cervical ganglion (the largest).
3. middle cervical ganglion (the smallest).
4. inferior cervical ganglion.

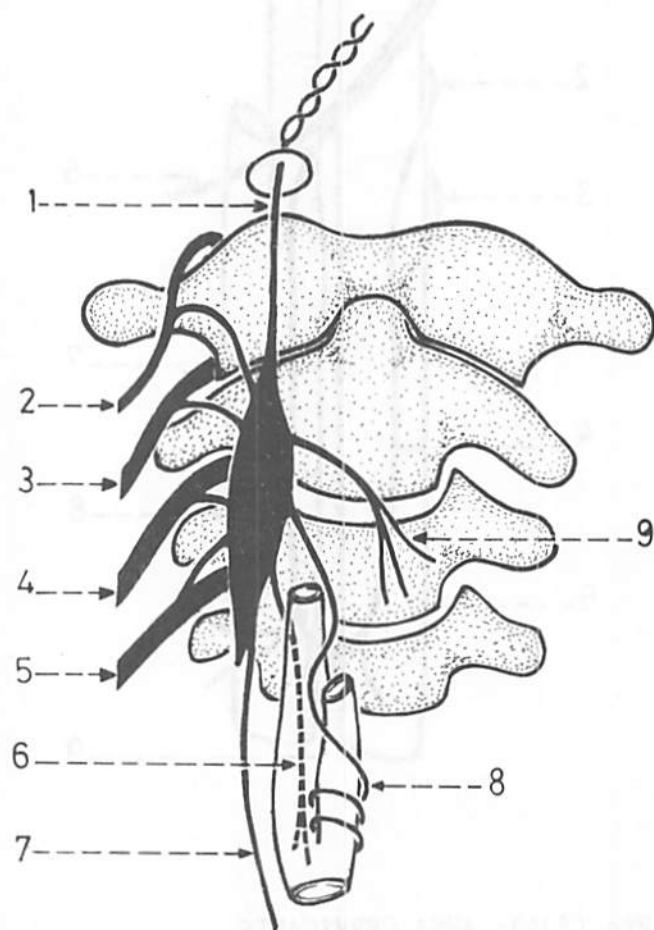


Fig.(547): SUPERIOR CERVICAL GANGLION

It lies opposite the 2nd and 3rd C.V. Its branches are: communicating (with the upper 4 cervical nerves), vascular (to arteries) and visceral (to pharynx, larynx and heart).

1. internal carotid nerve (forms a plexus around the internal carotid artery).
2. 1st cervical nerve.
3. 2nd cervical nerve.
4. 3rd cervical nerve.
5. 4th cervical nerve.
6. branch to the carotid body.
7. cardiac branch (to the heart).
8. plexus around the external carotid artery.
9. branch to the pharyngeal plexus.

Fig.(548): MIDDLE CERVICAL GANGLION

It lies opposite the 6th cervical vertebra in front of the inferior thyroid artery. Its branches are: communicating (with 5th and 6th cervical nerves), vascular (to inferior thyroid artery) and visceral (to the heart, trachea and oesophagus). It is connected with the inferior ganglion by a loop called ansa subclavia.

1. internal carotid nerve.
2. superior cervical ganglion.
3. 5th cervical nerve.
4. 6th cervical nerve.
5. inferior thyroid artery.
6. ansa subclavia.
7. subclavian artery.
8. inferior cervical ganglion.
9. middle cervical ganglion.

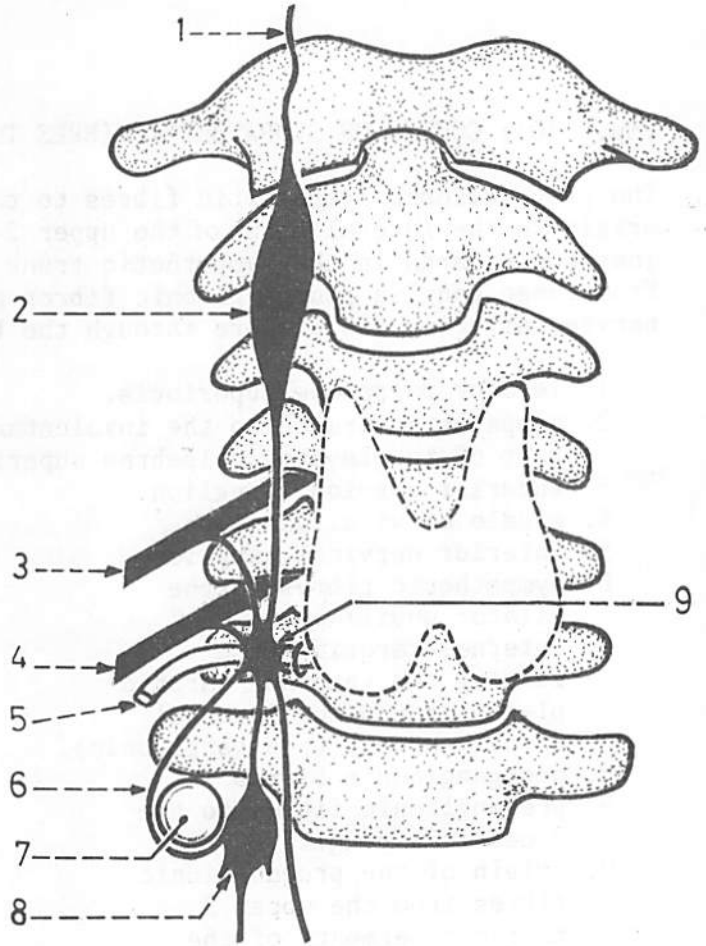


Fig.(549): INFERIOR CERVICAL GANGLION

It lies just above the neck of 1st rib behind the vertebral artery. Its branches are: communicating (with the 7th and 8th cervical nerves), vascular (to the subclavian and vertebral arteries) and visceral (to the heart).

1. 7th cervical nerve.
2. 8th cervical nerve.
3. inferior cervical ganglion.
4. ansa subclavia (a loop around the 1st part of subclavian artery extending from the middle to the inferior ganglion).
5. subclavian artery.
6. plexus around the vertebral artery.
7. middle cervical ganglion.
8. cardiac branch.

\* Usually the inferior ganglion fuses with the 1st thoracic ganglion to form the stellate or cervico-thoracic ganglion.

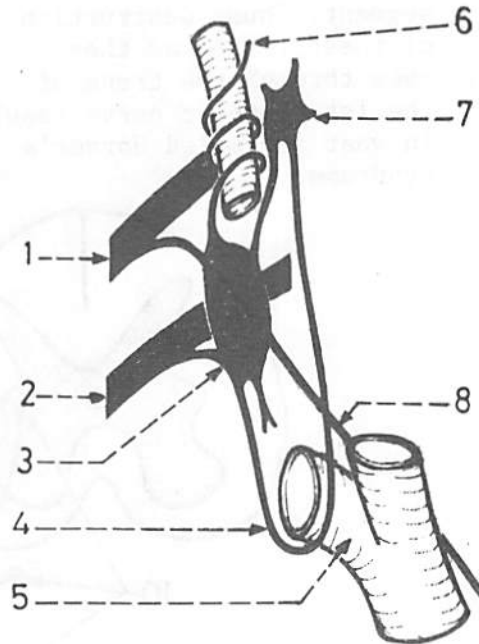
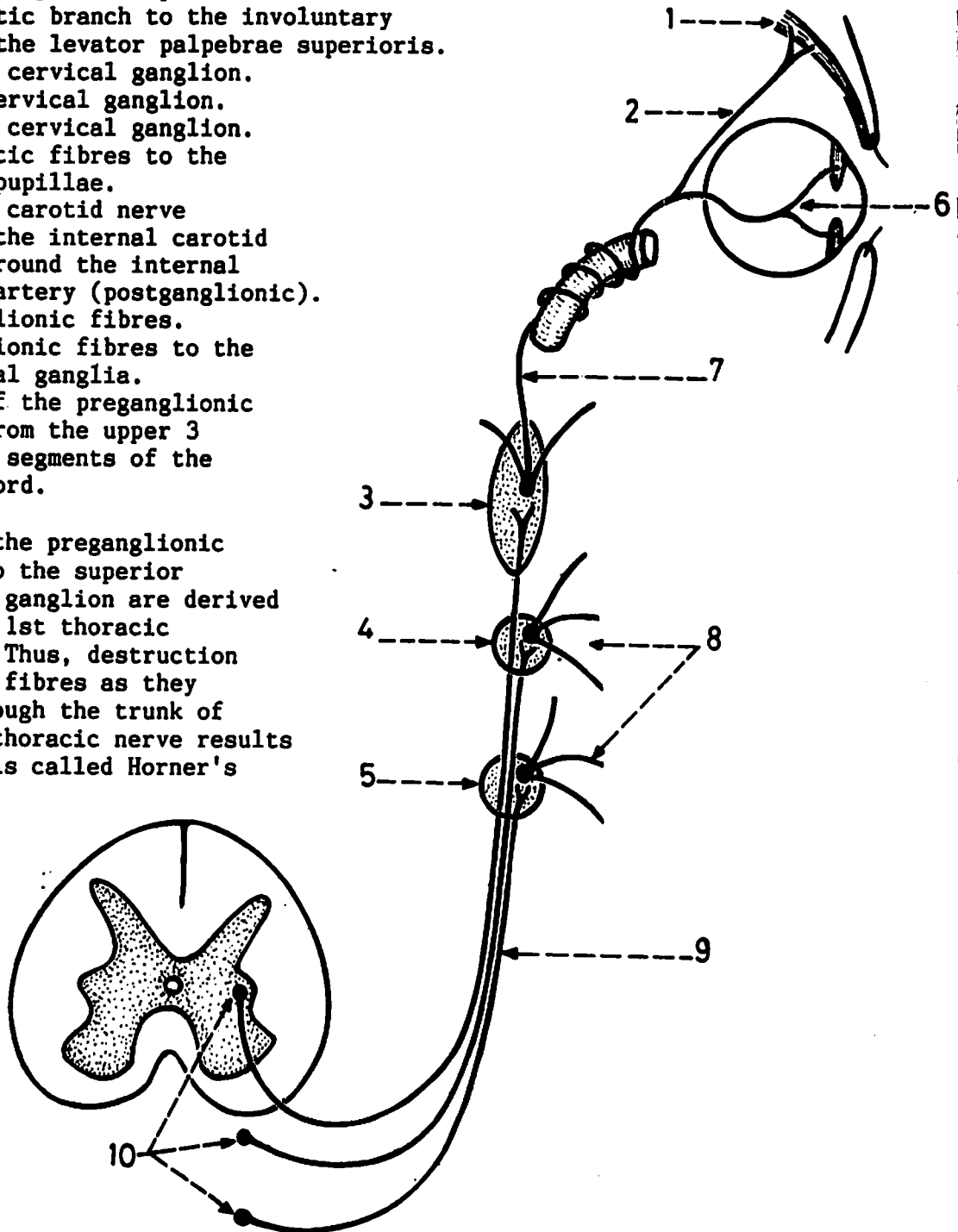


Fig.(550): COURSE OF SYMPATHETIC FIBRES TO THE HEAD AND NECK

The preganglionic sympathetic fibres to the head and neck have their cells of origin in the lateral horns of the upper 2-3 thoracic segments of the spinal cord. They run upwards in the sympathetic trunk to relay in the 3 cervical ganglia. From these ganglia postganglionic fibres arise and are distributed to spinal nerves, arteries and viscera through the branches of these ganglia.

1. levator palpebrae superioris.
2. sympathetic branch to the involuntary part of the levator palpebrae superioris.
3. superior cervical ganglion.
4. middle cervical ganglion.
5. inferior cervical ganglion.
6. sympathetic fibres to the dilator pupillae.
7. internal carotid nerve forming the internal carotid plexus around the internal carotid artery (postganglionic).
8. postganglionic fibres.
9. preganglionic fibres to the 3 cervical ganglia.
10. origin of the preganglionic fibres from the upper 3 thoracic segments of the spinal cord.

\* Most of the preganglionic fibres to the superior cervical ganglion are derived from the 1st thoracic segment. Thus, destruction of these fibres as they pass through the trunk of the 1st thoracic nerve results in what is called Horner's syndrome.



## LYMPH NODES OF HEAD AND NECK

Fig.(551): SUPERFICIAL LYMPH NODES

These nodes are superficially situated and drain the superficial tissues of the head and neck. Their efferent vessels drain into the deep cervical nodes. They are arranged into several groups of which 4 lie in the head (occipital, mastoid, parotid and buccal) and 4 in the neck (submental, submandibular, anterior cervical and superficial cervical).

1. occipital nodes (close to the external occipital protuberance).
2. mastoid nodes (on the mastoid process).
3. parotid nodes (on the surface of the parotid gland and embedded in its substance).
4. buccal nodes (on the surface of buccinator along the facial vein).
5. submental nodes (just below the chin).
6. submandibular nodes (just below the mandible in relation to the submandibular gland).
7. anterior cervical nodes (along the anterior jugular vein).
8. superficial cervical nodes (along the external jugular vein).

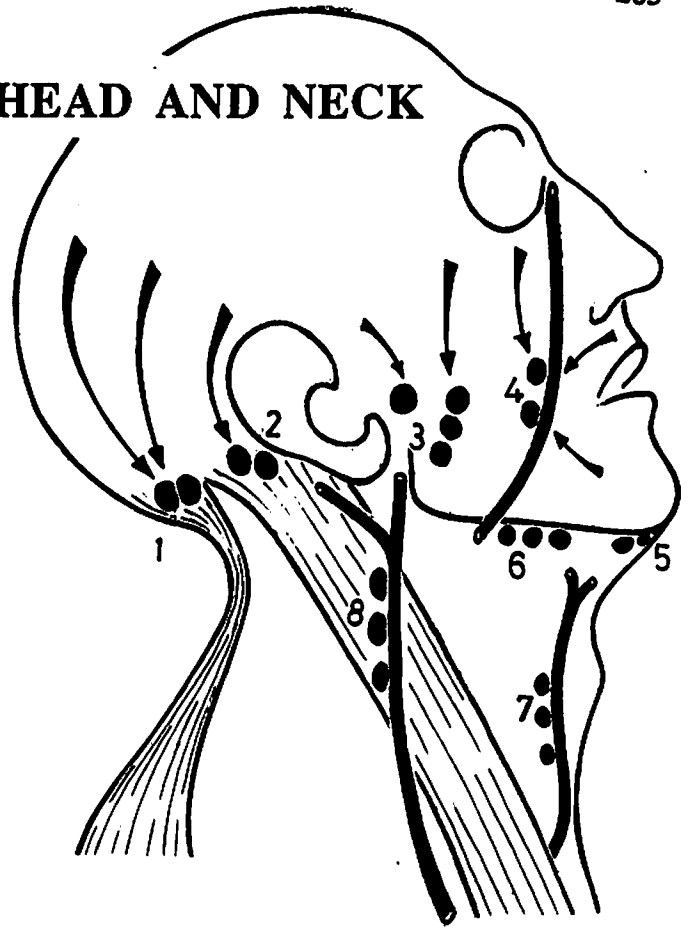


Fig.(552): DEEP CERVICAL LYMPH NODES

They lie along the carotid sheath deep to the sternomastoid and are subdivided into superior and inferior groups.

1. posterior belly of digastric.
2. superior group of lymph nodes.
3. omohyoid muscle.
4. subclavian lymph trunk.
5. jugular lymph trunk.
6. inferior group of lymph nodes.
7. right lymphatic duct.

- (a) jugulo-digastric lymph node.  
(b) jugulo-omohyoid lymph node.

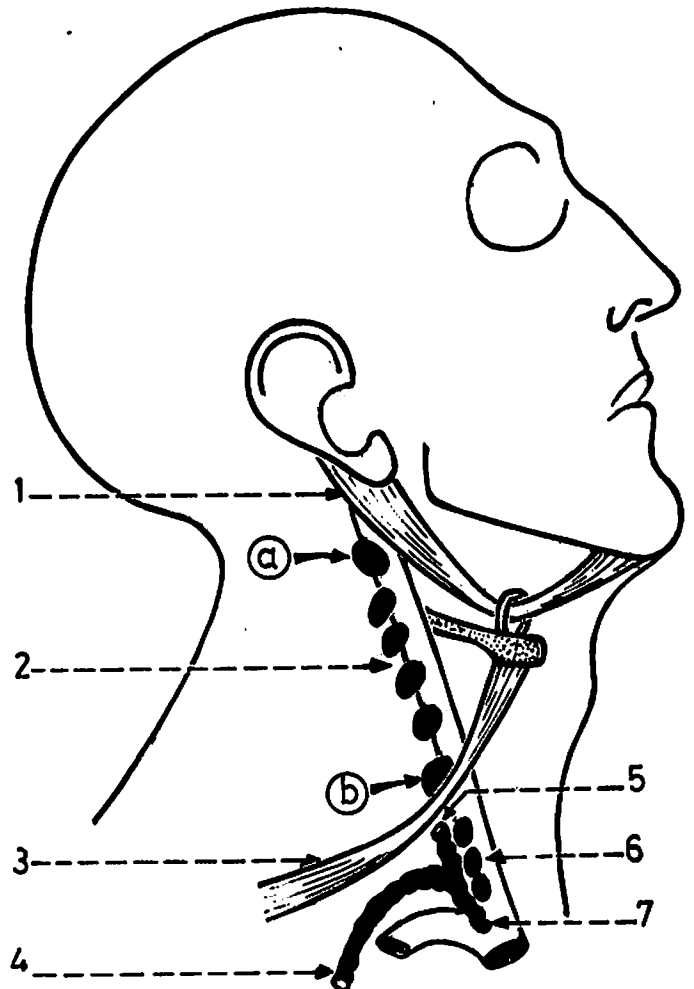


Fig.(553): DEEP NODES RELATED TO LARYNX AND TRACHEA

These are the paratracheal, pretracheal, prelaryngeal and infrahyoid lymph nodes.

1. infrahyoid nodes (on the thyrohyoid membrane).
2. prelaryngeal node (on the median part of the cricothyroid ligament).
3. pretracheal nodes (along the inferior thyroid veins, in front of the trachea).
4. inferior thyroid vein.
5. paratracheal nodes (along the recurrent laryngeal nerve lateral to the trachea).
6. recurrent laryngeal nerve.
7. inferior thyroid artery.

\* These nodes send their efferents to the deep cervical nodes.

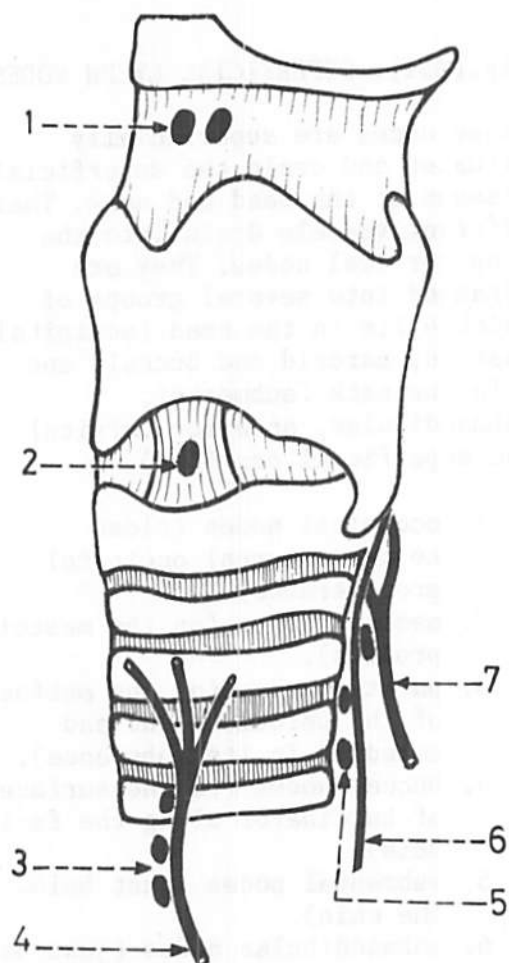
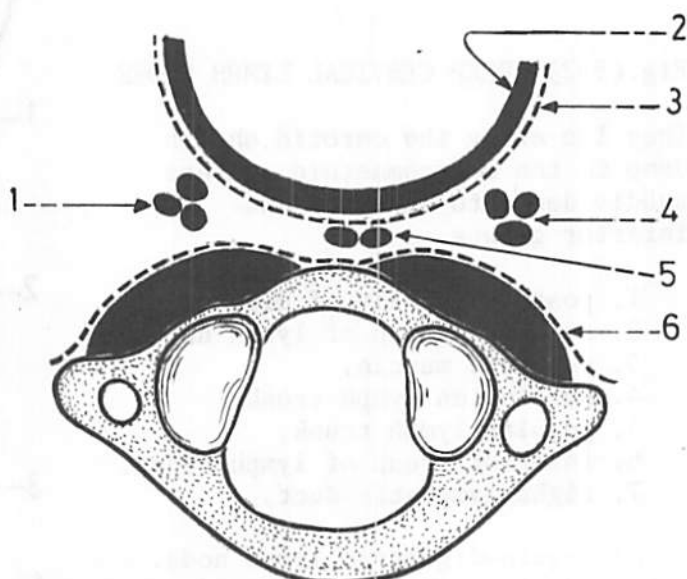


Fig.(554): RETROPHARYNGEAL LYMPH NODES

These are 3 groups situated behind the pharynx (one median and 2 lateral).

1. lateral retropharyngeal nodes.
2. muscular wall of the pharynx (superior constrictor).
3. buccopharyngeal fascia.
4. lateral retropharyngeal nodes.
5. median retropharyngeal nodes.
6. prevertebral fascia.

\* These retropharyngeal nodes send their efferents to the upper deep cervical nodes.



# ORAL CAVITY

Fig.(555): PARTS OF THE ORAL CAVITY

The cavity of the mouth consists of the vestibule (outside the teeth) and the oral cavity proper (to the inner side of the teeth).

1. soft palate (forms a part of the roof of the cavity).
2. oropharyngeal isthmus (is the communication between the oral cavity and pharynx).
3. oral cavity proper (contains the tongue).
4. vestibule of the mouth (bounded externally by the lips and cheeks).

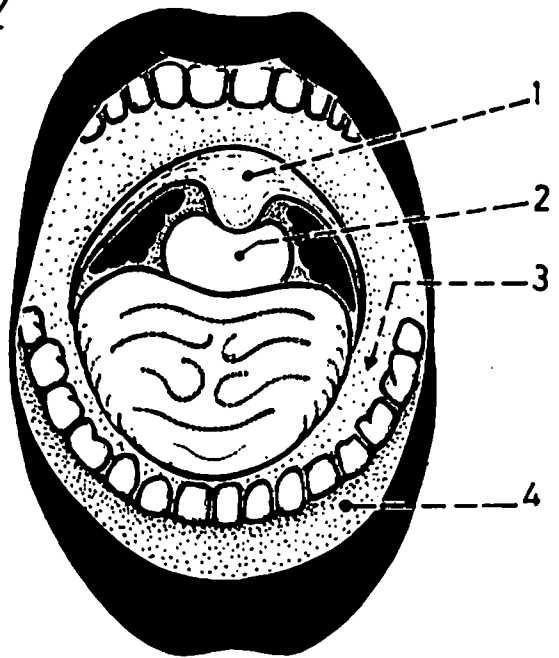


Fig.(556): PARTS OF THE ORAL CAVITY  
(side view)

1. tongue.
2. oropharyngeal isthmus.
3. oral cavity proper.
4. vestibule of the mouth.

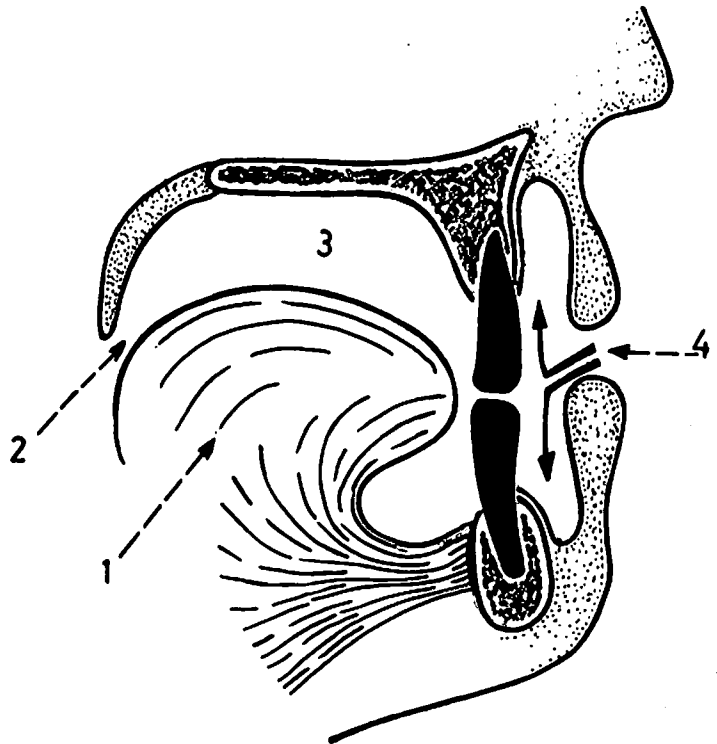


Fig.(557): COMMUNICATION BETWEEN THE VESTIBULE  
AND THE ORAL CAVITY PROPER

This communication takes place, with the jaws closed, behind the 3rd molar teeth (arrows).

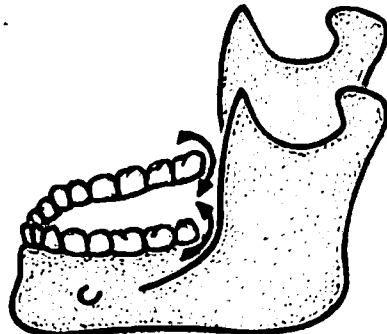


Fig.(558): STRUCTURE OF THE CHEEK

It consists of the buccinator muscle which is covered externally by skin, pad of fat and buccopharyngeal fascia, and lined internally by mucous membrane. It is pierced by the parotid duct which opens into the vestibule on a small papilla opposite the upper 2nd molar tooth.

1. mucous membrane of the vestibule.
2. buccinator muscle.
3. parotid duct.
4. buccal pad of fat.
5. vestibule of the mouth.
6. buccopharyngeal fascia.

\* The buccinator muscle has a number of buccal glands on its inner surface between it and the mucous membrane.

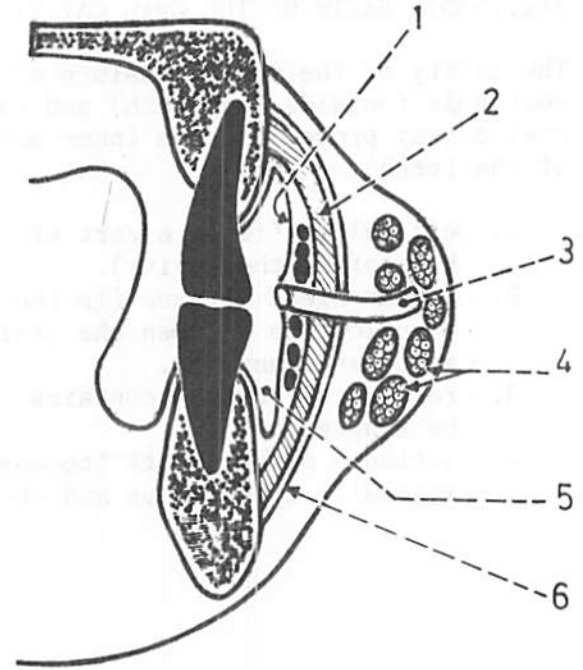


Fig.(559): MUSCLES OF THE FLOOR OF THE MOUTH

These are the mylohyoid, geniohyoid and genioglossus muscles. The 2 mylohyoid muscles unite together at the median raphe forming what is called diaphragma oris.

1. mucous membrane of the floor of the mouth.
2. genioglossus muscle (close to the midline just below the tongue).
3. tongue.
4. mylohyoid muscle.
5. geniohyoid muscle (close to the midline between the genioglossus above and the mylohyoid below).

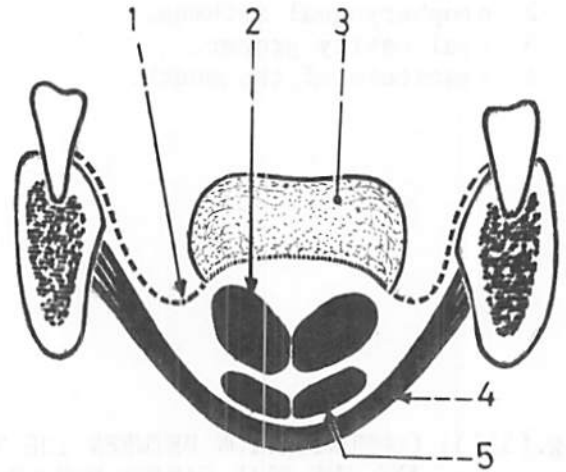


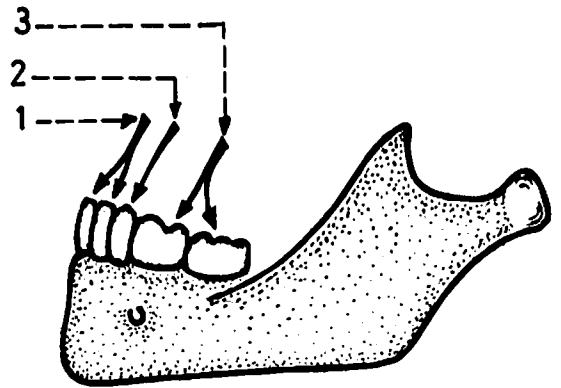
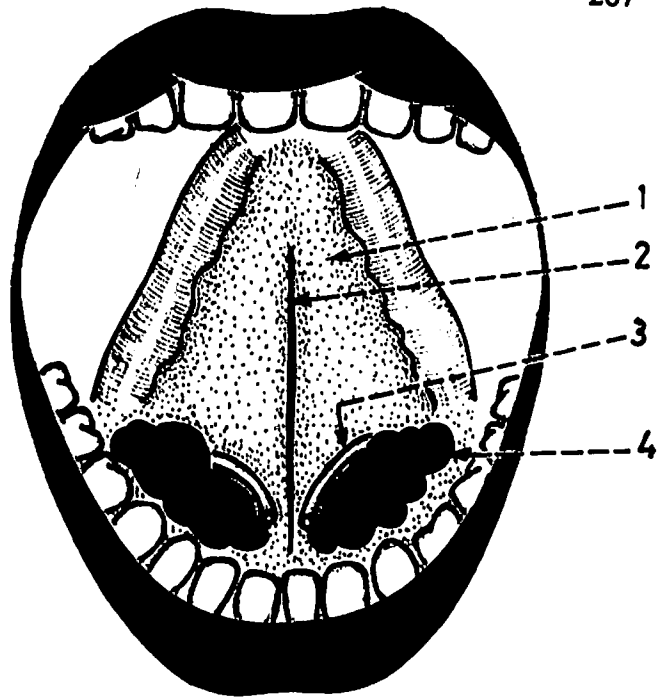


Fig.(560): STRUCTURES IN THE FLOOR OF ORAL CAVITY

These are the frenulum linguae in the midline and 2 sublingual folds one on each side of the midline. Each sublingual fold is an elevation of the mucous membrane produced by the sublingual salivary gland.

1. under surface of the tongue (the tongue is elevated).
2. frenulum linguae (a median fold of mucous membrane connecting the under surface of the tongue to the floor of the mouth).
3. submandibular duct (opens on a small elevation on the side of the lower end of the frenulum called the sublingual papilla).
4. sublingual gland (forms the sublingual fold).

\* Note that the submandibular and sublingual glands open into the floor of the mouth cavity proper, while the parotid gland opens into the vestibule of the mouth.



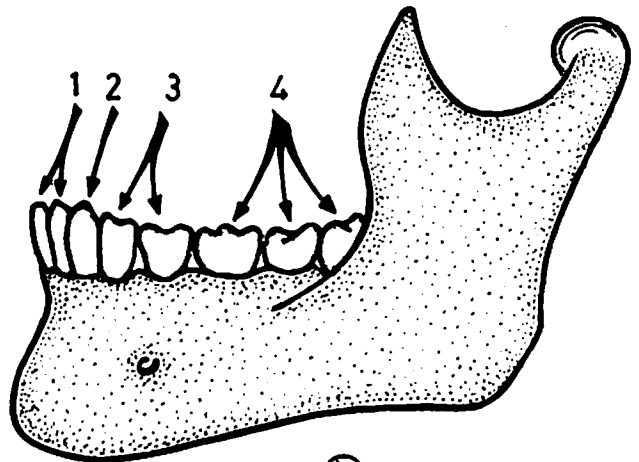
(a)

Fig.(561): DECIDUOUS AND PERMANENT TEETH

The deciduous teeth are temporary and complete their appearance by the 2nd year, while the permanent teeth begin their appearance by the 6th year and are complete by 17-21 years.

- (a) Deciduous teeth: they are all 20 in number distributed as follows: 4 incisors, 2 canines and 4 molars in each jaw.

1. incisors.
2. canine.
3. molars.



(b)

- (b) Permanent teeth: they are all 32 in number distributed as follows: 4 incisors, 2 canines, 4 premolars and 6 molars in each jaw.
1. incisors; 2. canine; 3. premolars; 4. molars.

Fig.(562): SUPERIOR AND INFERIOR ALVEOLAR NERVES

There are 3 superior alveolar nerves to the upper jaw and only one inferior nerve to the lower jaw.

1. maxillary nerve.
2. posterior superior alveolar nerve.
3. inferior alveolar nerve.
4. middle superior alveolar nerve.
5. anterior superior alveolar nerve.

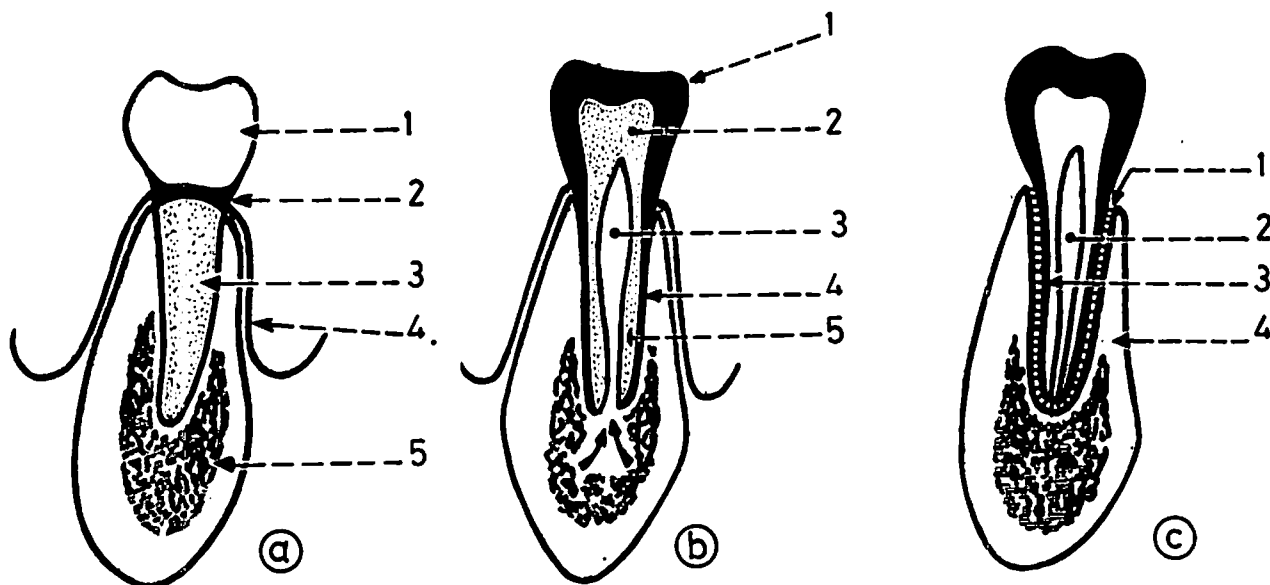
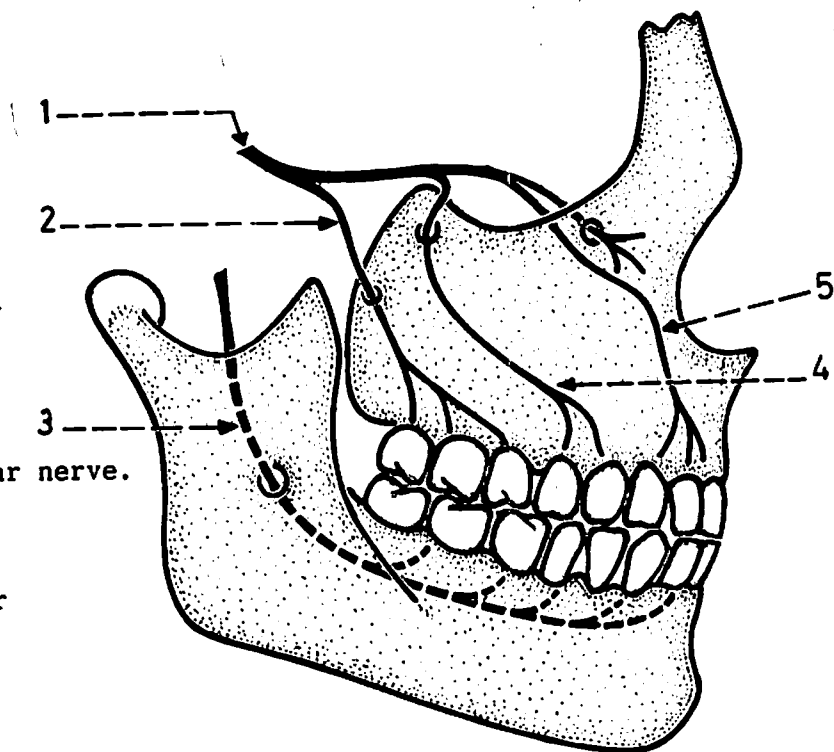


Fig.(563): ANATOMY OF THE TOOTH

- (a) Parts of the tooth: a tooth consists of 3 parts called crown, root and neck.  
1. crown; 2. neck; 3. root; 4. gum ; 5. socket of the tooth.
- (b) Structure of the tooth: a tooth has a soft central part called pulp which is covered by the dentine. The dentine of the crown is covered by the enamel, while the dentine of the root is covered by the cement.  
1. enamel; 2. dentine of the crown; 3. pulp of the tooth; 4. cement;  
5. dentine of the root.
- (c) Periodontal membrane: fixes the cement of the root to the bone of the socket.  
1. periodontal membrane; 2. pulp of the tooth; 3. cement; 4. socket.

# TONGUE

Fig.(564): PARTS OF THE TONGUE

The tongue has a root which is attached to the floor of the mouth, and a free part which ends at the tip. It has a dorsal surface directed upwards and backwards and an inferior surface directed downwards towards the floor of the mouth.

1. anterior or oral part of the dorsal surface.
2. posterior or pharyngeal part of the dorsal surface.
3. epiglottis (separated from the tongue by a depression called vallecula).
4. root of the tongue (attached to the floor of the mouth).
5. inferior surface.
6. tip of the tongue.

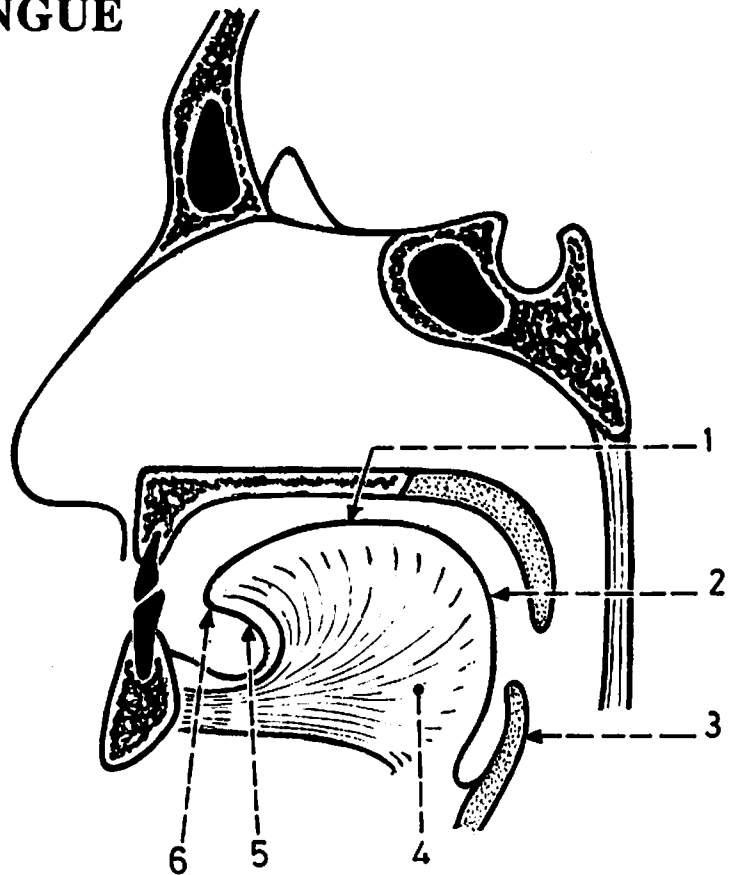


Fig.(565): DORSUM OF THE TONGUE

It is divided by the sulcus terminalis into an anterior 2/3 called oral part and a posterior 1/3 called pharyngeal part or base of the tongue.

1. pharyngeal part (forms the anterior wall of the oropharynx and lodges the lingual tonsil).
2. foramen caecum (a pit at the apex of the V-shaped sulcus terminalis).
3. sulcus terminalis (a V-shaped groove).
4. vallate papillae (lie immediately in front and parallel to the sulcus terminalis).
5. fungiform papillae (lie mainly at the sides and apex of the tongue).
6. filiform papillae.

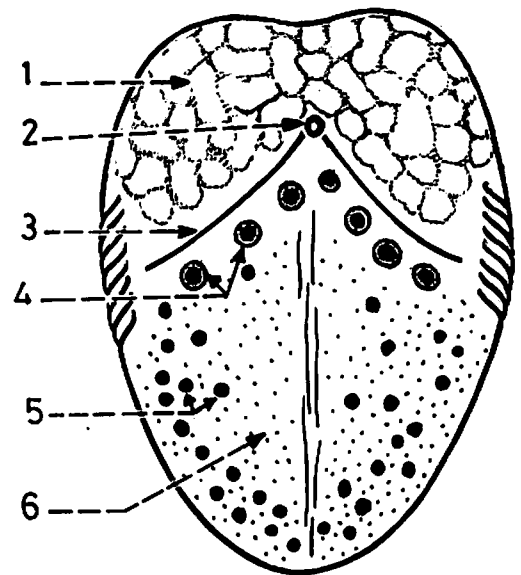


Fig.(566): BASE OF THE TONGUE

It is the pharyngeal part of the dorsum of the tongue which forms the anterior wall of the oropharynx and is attached to the epiglottis by 3 glosso-epiglottic folds (one median and 2 lateral).

1. lateral glosso-epiglottic fold.
2. median glosso-epiglottic fold.
3. epiglottis (seen from above).
4. vallecula (a depression).
5. palatoglossal arch.
6. base of the tongue.

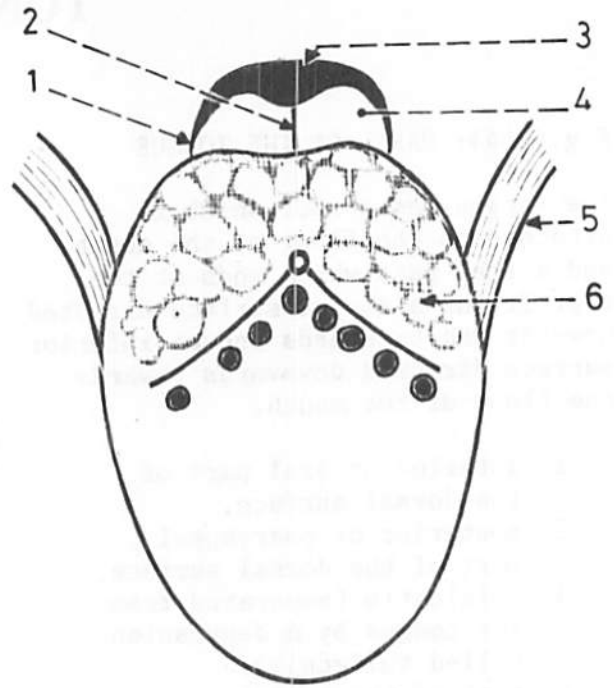


Fig.(567): LINGUAL TONSIL

It is a mass of lymphoid tissue embedded in the submucosa of the base of the tongue.

1. palatoglossal arch (formed by the palatoglossus muscle).
2. lingual tonsil.
3. vallecula.
4. epiglottis.

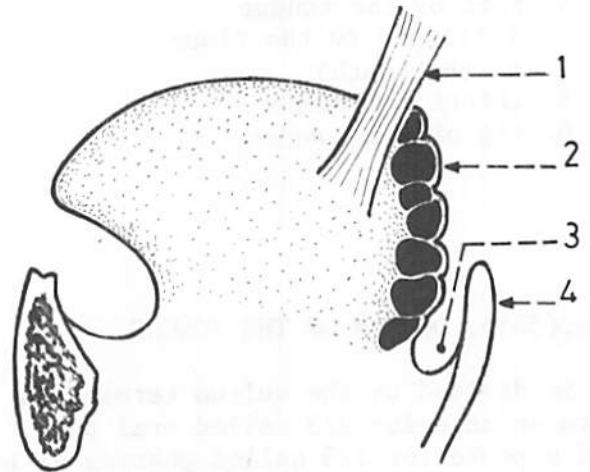
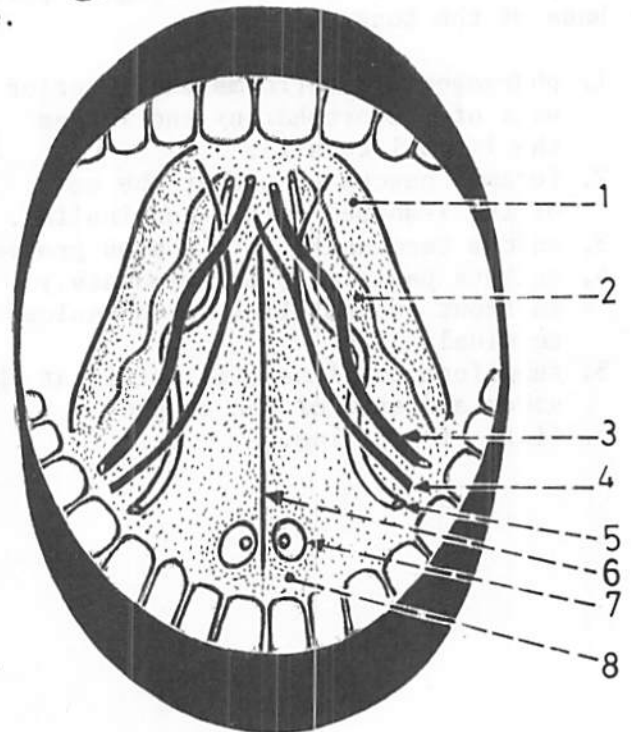


Fig.(568): INFERIOR SURFACE OF THE TONGUE

It shows the frenulum linguae in the midline. On each side of the frenulum lie the lingual vein, lingual artery and lingual nerve. More laterally, lies a fringed fold of mucous membrane called plica fimbriata which is directed towards the apex of the tongue.

1. inferior surface of the tongue.
2. plica fimbriata.
3. lingual vein.
4. lingual nerve.
5. lingual artery.
6. frenulum linguae.
7. sublingual papilla (a small elevation which bears the orifice of the submandibular duct).
8. sublingual fold.



\* The sublingual fold and sublingual papilla lie in the floor of the mouth.

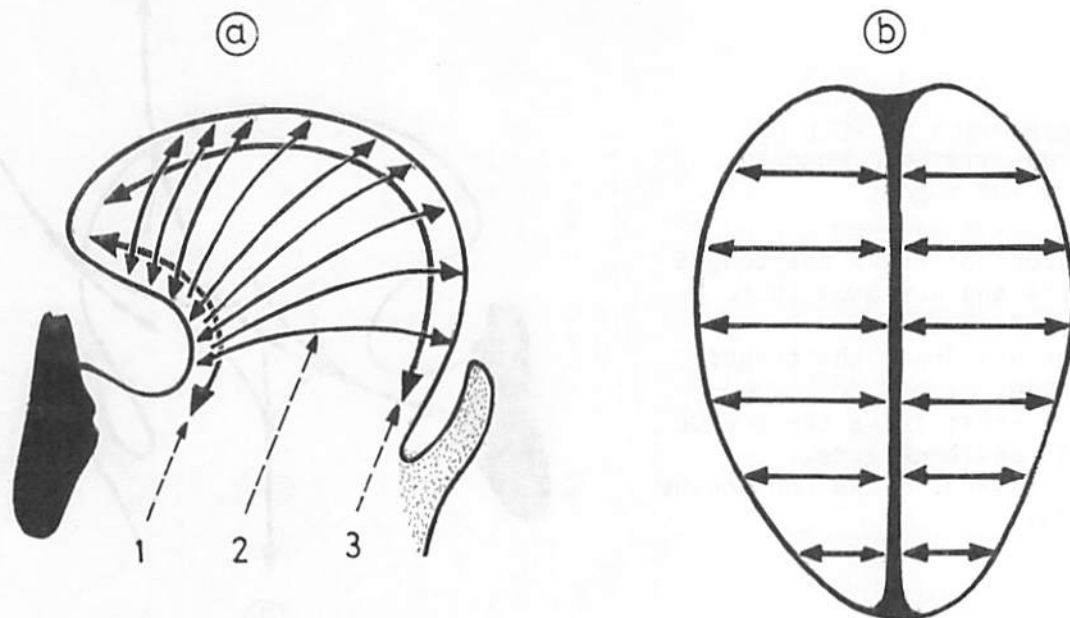


Fig.(569): INTRINSIC MUSCLES OF THE TONGUE

These are muscles which arise and end within the substance of the tongue with no external attachment.

(a) Superior longitudinal, inferior longitudinal and vertical muscles:

1. inferior longitudinal muscle (extends from the root of the tongue to the tip, on the inferior surface).
2. vertical muscle (extends from the inferior surface to the dorsum of the tongue).
3. superior longitudinal muscle (extends from the root of the tongue to the tip, on the dorsal surface).

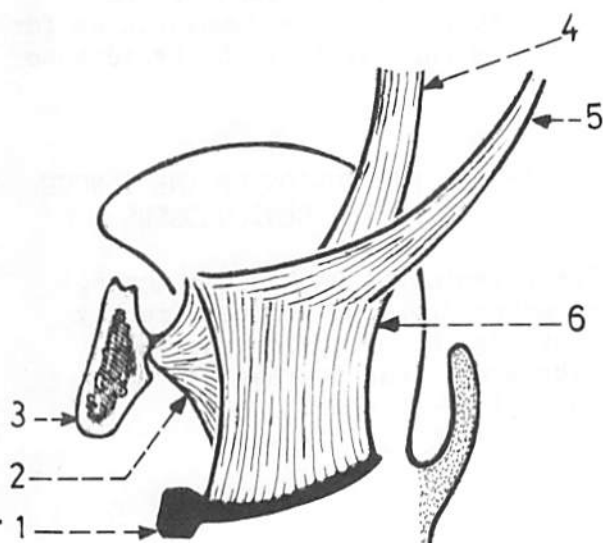
(b) Transverse muscle:

It consists of transverse fibres extending from the median fibrous septum to the edge of the tongue. This fibrous septum divides the tongue into right and left halves.

Fig.(570): EXTRINSIC MUSCLES OF THE TONGUE

These are muscles which arise from structures outside the tongue (mandible, hyoid bone, styloid process and soft palate) and are inserted into the substance of the tongue.

1. hyoid bone.
2. genioglossus (from the superior genial tubercle).
3. mandible (cut).
4. palatoglossus (from the soft palate).
5. styloglossus (from the styloid process).
6. hyoglossus (from the greater horn of hyoid bone).



\* See previous chapters for more details on these muscles.

Fig.(571): DIRECTION OF PULL OF THE EXTRINSIC MUSCLES OF THE TONGUE

1. genioglossus: draws the tongue forwards and deviates it to the opposite side.
2. hyoglossus: draws the tongue downwards.
3. styloglossus: draws the tongue upwards and backwards.
4. palatoglossus: draws the tongue upwards.

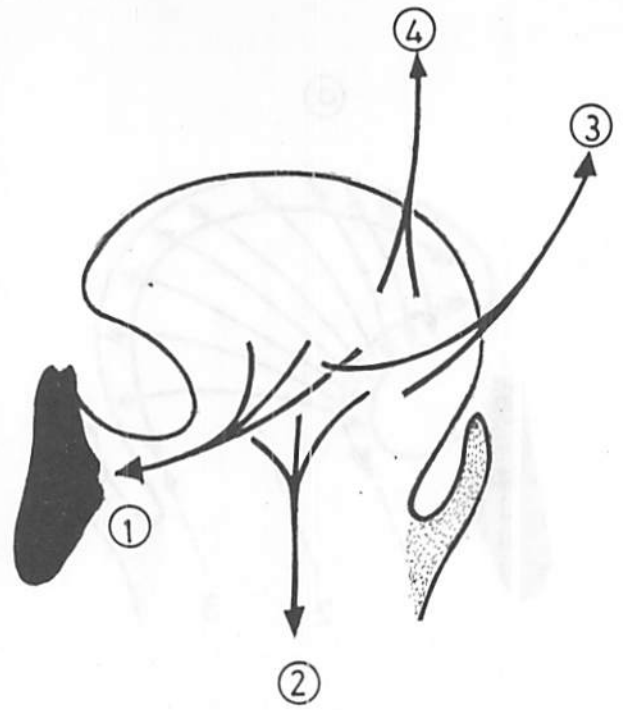


Fig.(572): DIRECTIONS OF FIBRES OF GENIOGLOSSUS

The fibres of genioglossus spread out from its origin towards the tongue in a fan-like form.

1. superior fibres: spread towards the apex.
2. middle fibres: pass backwards and upwards to the whole length of the inferior surface of the tongue.
3. inferior fibres: pass backwards to get inserted into the body of hyoid bone.
4. body of hyoid bone.

\* Note that the root of the tongue extends downwards as far as the level of the hyoid bone.

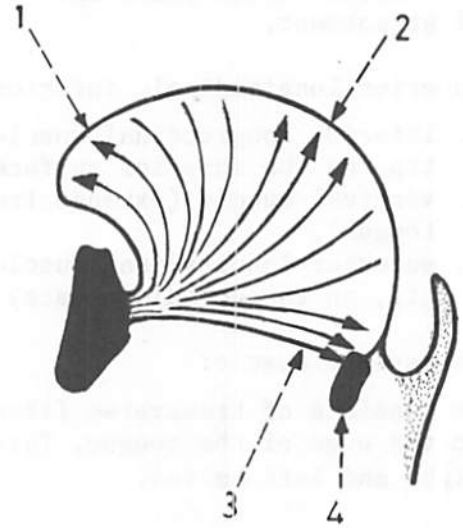


Fig.(573): PROTRUSION OF THE TONGUE BY THE GENIOGLOSSUS

The 2 genioglossus muscles acting together draw the tongue directly forwards. However, the superior fibres only can depress the free part of the tongue.

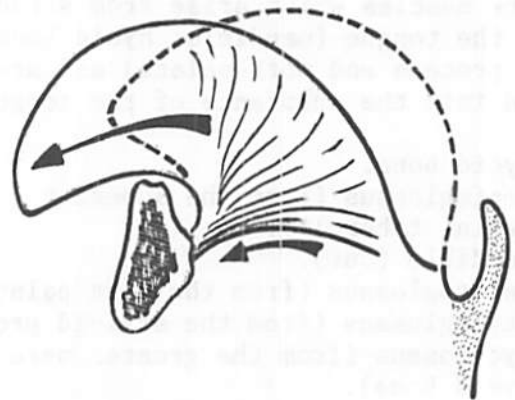


Fig.(574): LINGUAL ARTERY

It is the main artery of the tongue. It continues on the inferior surface of the tongue as far as its tip.

1. dorsal lingual branches (to the posterior part of the dorsum of the tongue).
2. external carotid artery.
3. 1st part of lingual artery.
4. 2nd part of lingual artery (deep to the hyoglossus).
5. 3rd part of lingual artery (also named profunda artery of the tongue).

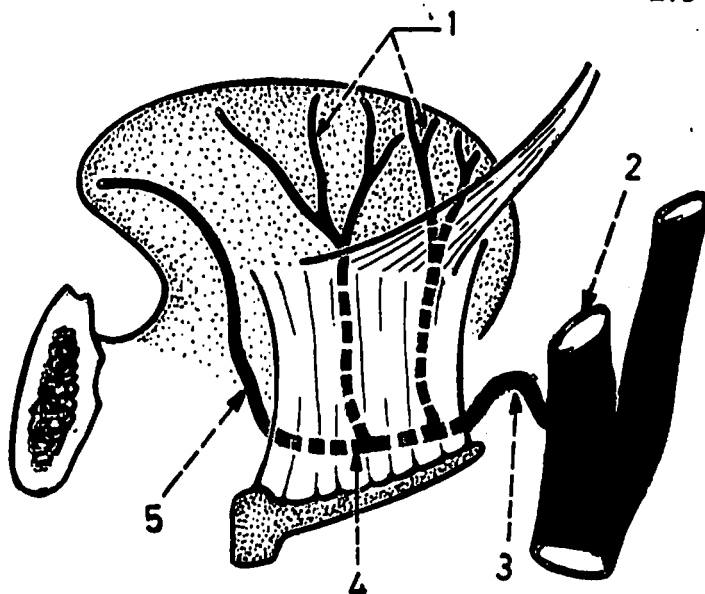


Fig.(575): VEINS OF THE TONGUE

The tongue is drained by 2 sets of veins: a set deep to the hyoglossus in company with the lingual artery and a set superficial to the hyoglossus in company with the hypoglossal nerve. These veins unite behind the hyoglossus and end in the internal jugular vein.

1. veins draining the dorsum and sides of the tongue.
2. deep lingual vein (runs on the inferior surface of the tongue close to the midline).
3. vein accompanying the hypoglossal nerve.
4. internal jugular vein.

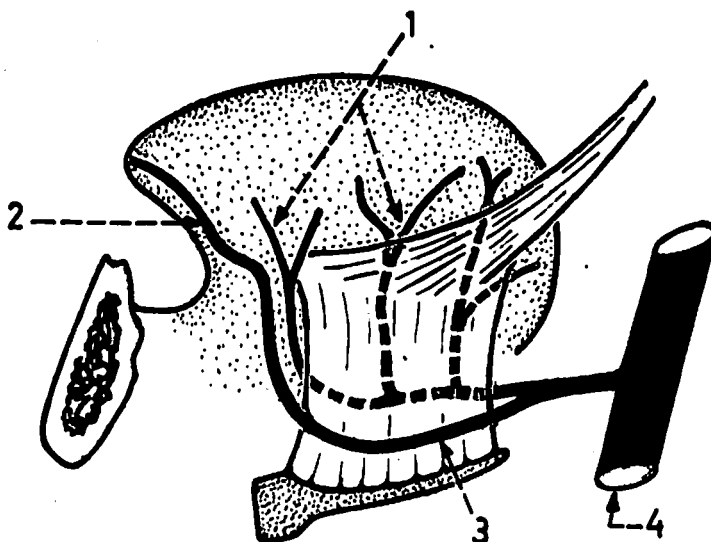
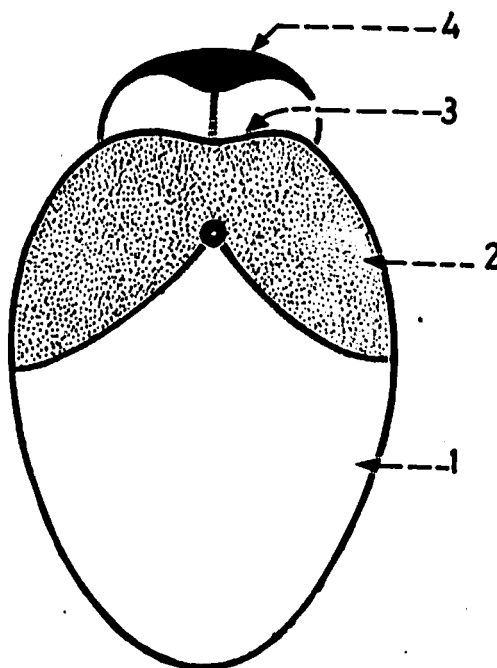


Fig.(576): DISTRIBUTION OF SENSORY NERVES OF THE TONGUE

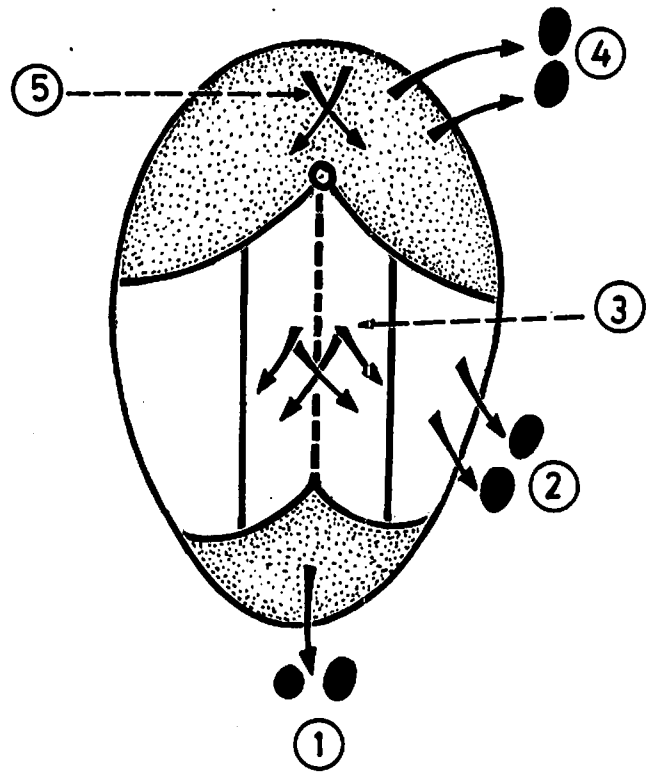
1. anterior 2/3 of the tongue supplied by the lingual nerve (general sensations) and by chorda tympani (taste sensation).
2. posterior 1/3 of the tongue supplied by the glossopharyngeal nerve (general and taste sensations).
3. most posterior part of the tongue just in front of the epiglottis supplied by the vagus.
4. epiglottis.



**Fig.(577): LYMPHATIC DRAINAGE OF THE TONGUE**

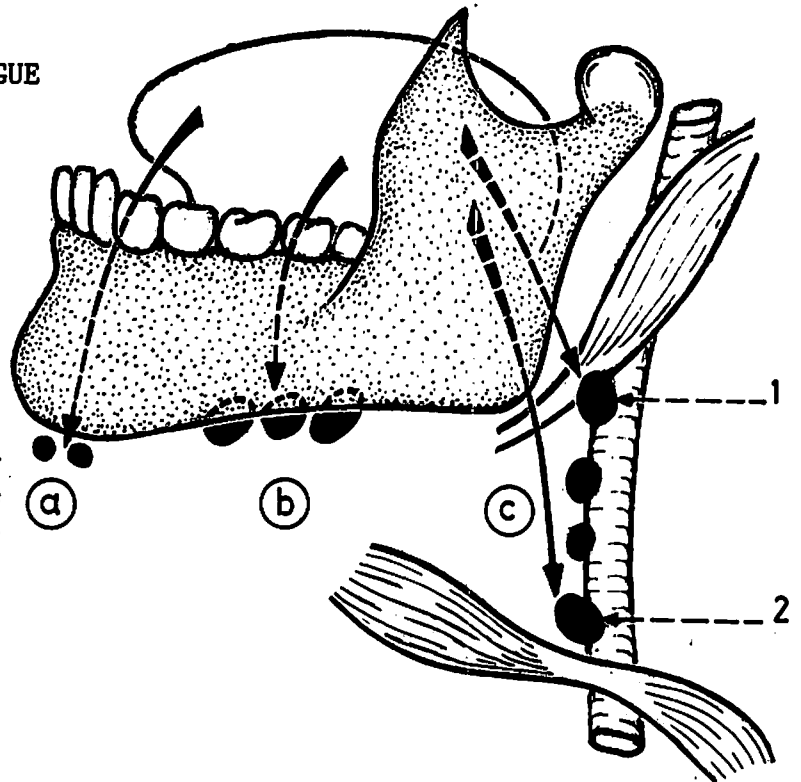
1. tip of the tongue: drains into the submental nodes of both sides.
2. margin of the anterior 2/3: drains into the submandibular nodes of the same side.
3. central part of the dorsum of the anterior 2/3: drains into the submandibular and deep cervical nodes of both sides.
4. margin of the posterior 1/3: drains into the deep cervical nodes of the same side.
5. central part of the posterior 1/3: drains into the deep cervical nodes of both sides.

\* The jugulo-digastric and jugulo-omohyoid nodes are the 2 main nodes of the deep cervical group which receive the lymphatics of the tongue.



**Fig.(578): LYMPH NODES OF THE TONGUE**

- (a) submental nodes (drain the tip).
  - (b) submandibular nodes (drain the anterior 2/3).
  - (c) deep cervical nodes (drain the posterior 1/3 directly and the anterior 2/3 indirectly).
1. jugulo-digastric lymph node (lies close to the posterior belly of the digastric where it crosses over the internal jugular vein).
  2. jugulo-omohyoid lymph node (lies close to the intermediate tendon of omohyoid where it crosses over the internal jugular vein).





## SOFT PALATE

Fig.(579): POSITION OF THE  
SOFT PALATE

It is suspended from the posterior border of the hard palate and hangs between the oral cavity and the pharynx.

1. nasopharynx.
2. palatine aponeurosis (a firm fibrous layer in the soft palate).
3. soft palate.
4. uvula.
5. hard palate.

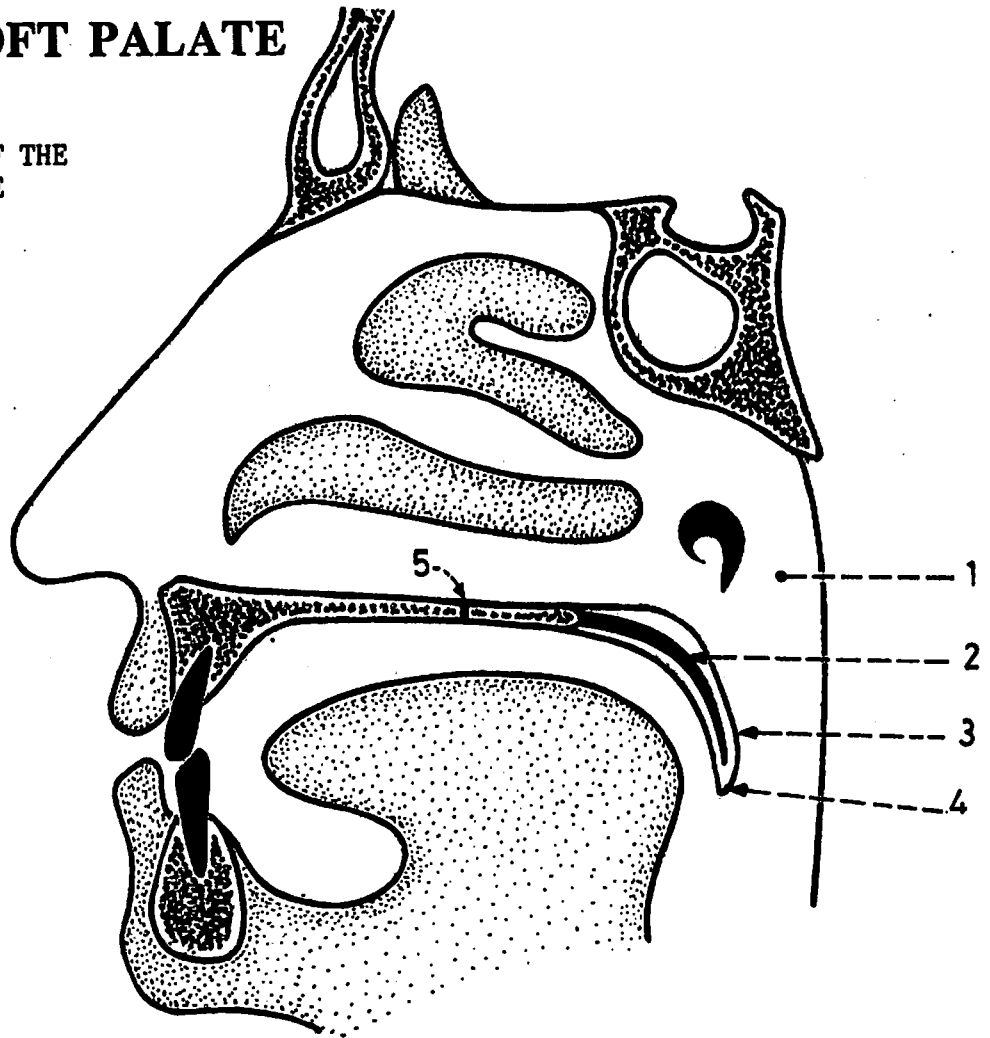


Fig.(580): STRUCTURE OF THE SOFT PALATE

It consists of a palatine aponeurosis and palatine muscles covered by mucous membrane. The palatine aponeurosis is a firm fibrous layer formed by the expanded tendon of the tensor palati muscle.

1. hard palate.
2. muscle layer below the palatine aponeurosis.
3. palatine aponeurosis (attached in front to the posterior border of the hard palate).
4. muscle layer above the palatine aponeurosis.
5. free posterior border of soft palate.

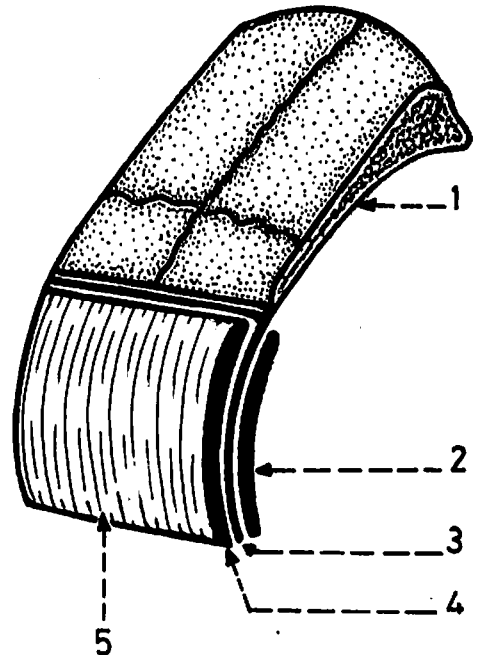
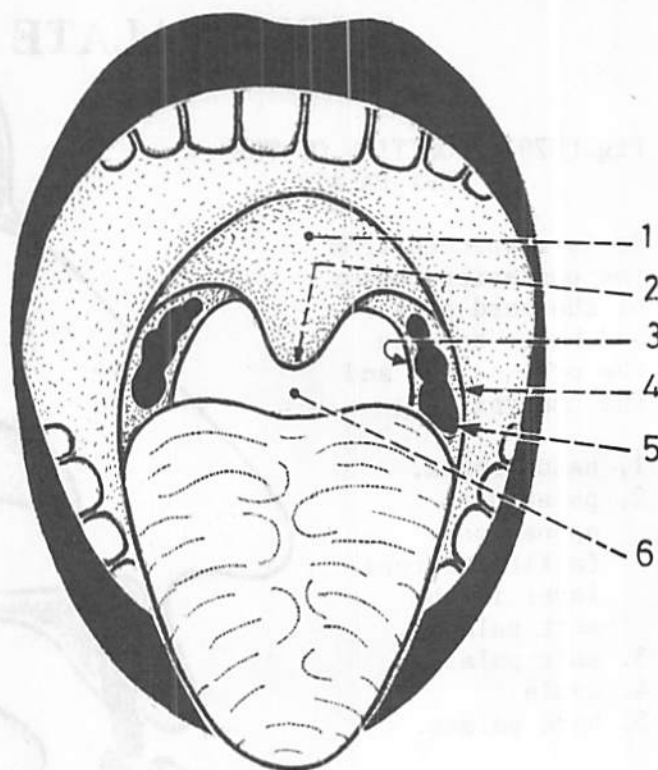


Fig.(581): PALATOGLOSSAL AND PALATOPHARYNGEAL ARCHES

These are 2 muscular arches which extend downwards and laterally on each side of the base of the uvula. The palatine tonsil lies in the fossa between the 2 arches. The palatoglossal arch is the anterior one and forms the lateral boundary of the oropharyngeal isthmus.



1. soft palate.
2. uvula.
3. palatopharyngeal arch (descends on the side of the oropharynx).
4. palatoglossal arch (attached to the side of the tongue).
5. palatine tonsil.
6. oropharyngeal isthmus (is the communication between the oral cavity and oropharynx).

Fig.(582): MUSCLES OF SOFT PALATE

These are 5 muscles: levator palati, tensor palati, palatoglossus, palatopharyngeus and musculus uvulae.

1. palatoglossus muscle (from the palatine aponeurosis to the side of the tongue).
2. pterygoid hamulus.
3. tensor palati (from the scaphoid fossa to the palatine aponeurosis).
4. auditory tube (between the origins of tensor palati laterally and levator palati medially).
5. levator palati (from the petrous bone to the palatine aponeurosis).
6. palatopharyngeus (from the palatine aponeurosis to the posterior border of thyroid cartilage).
7. palatine tonsil.

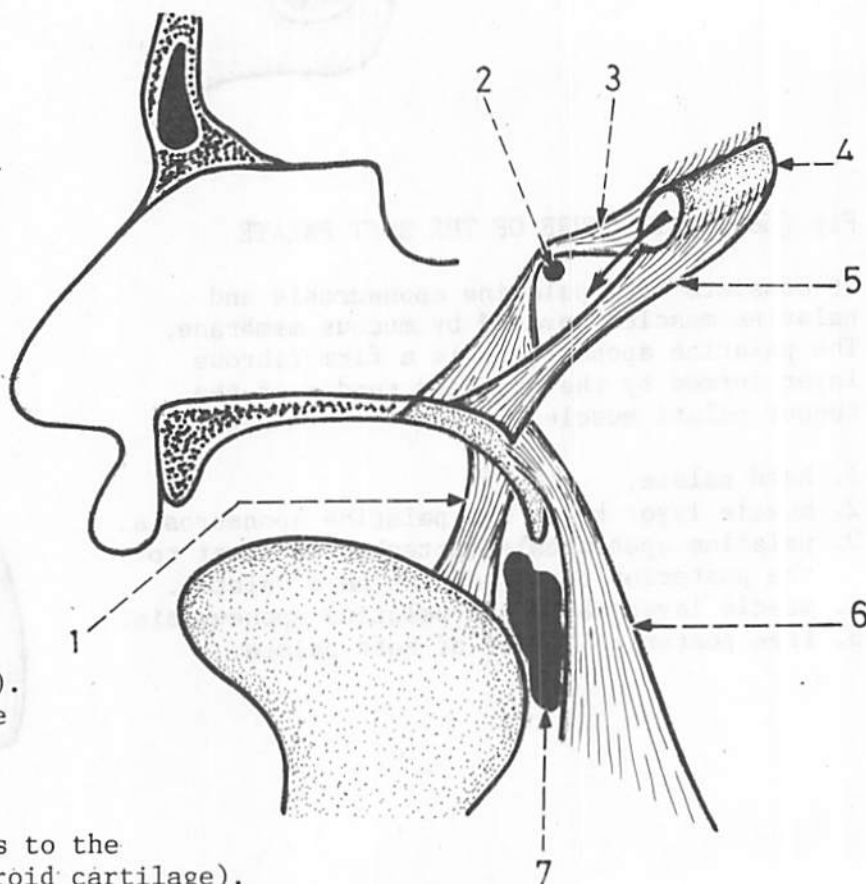


Fig.(583): TENSOR PALATI MUSCLES  
OF BOTH SIDES

Each muscle arises from the scaphoid fossa, lateral aspect of the auditory tube and spine of sphenoid. Its narrow tendon curves medially around the pterygoid hamulus to get inserted into the palatine aponeurosis and the horizontal plate of palatine bone.

1. palatine aponeurosis.
2. pterygoid hamulus.
3. tensor palati muscle.
4. foramen ovale (lateral to the muscle).
5. foramen spinosum (lateral to the muscle).
6. spine of sphenoid.
7. cartilagenous part of auditory tube.

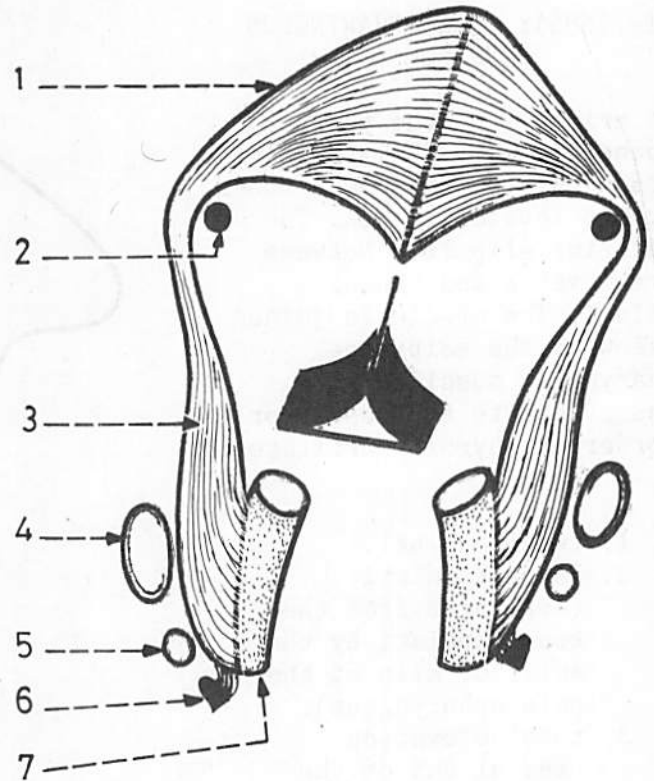


Fig.(584): ACTION OF TENSOR PALATI

Acting together, the 2 muscles tighten the soft palate (hence the name tensor palati).

1. palatine aponeurosis (insertion).
2. pterygoid hamulus.
3. origin of the muscle from the base of the skull.

\* The arrows represent the direction of pull of the muscle.

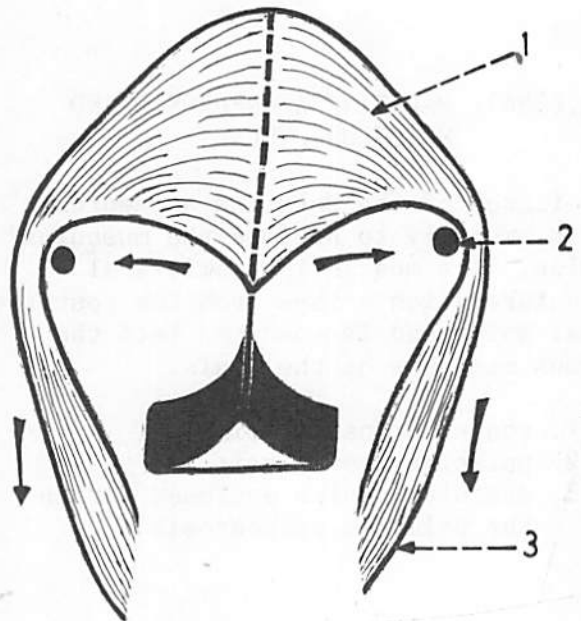


Fig.(585): PALATOPHARYNGEUS MUSCLE

It arises from the palatine aponeurosis by 2 slips which are separated from each other by the levator palati. The anterior slip lies between the levator and tensor palati. The muscle is joined below by the salpingopharyngeus muscle and is inserted into the posterior border of thyroid cartilage.

1. tensor palati.
2. levator palati  
(separated from the tensor palati by the anterior slip of the palatopharyngeus).
3. tubal elevation  
(medial end of the auditory tube).
4. salpingopharyngeus.
5. palatopharyngeus.
6. posterior border of thyroid cartilage.

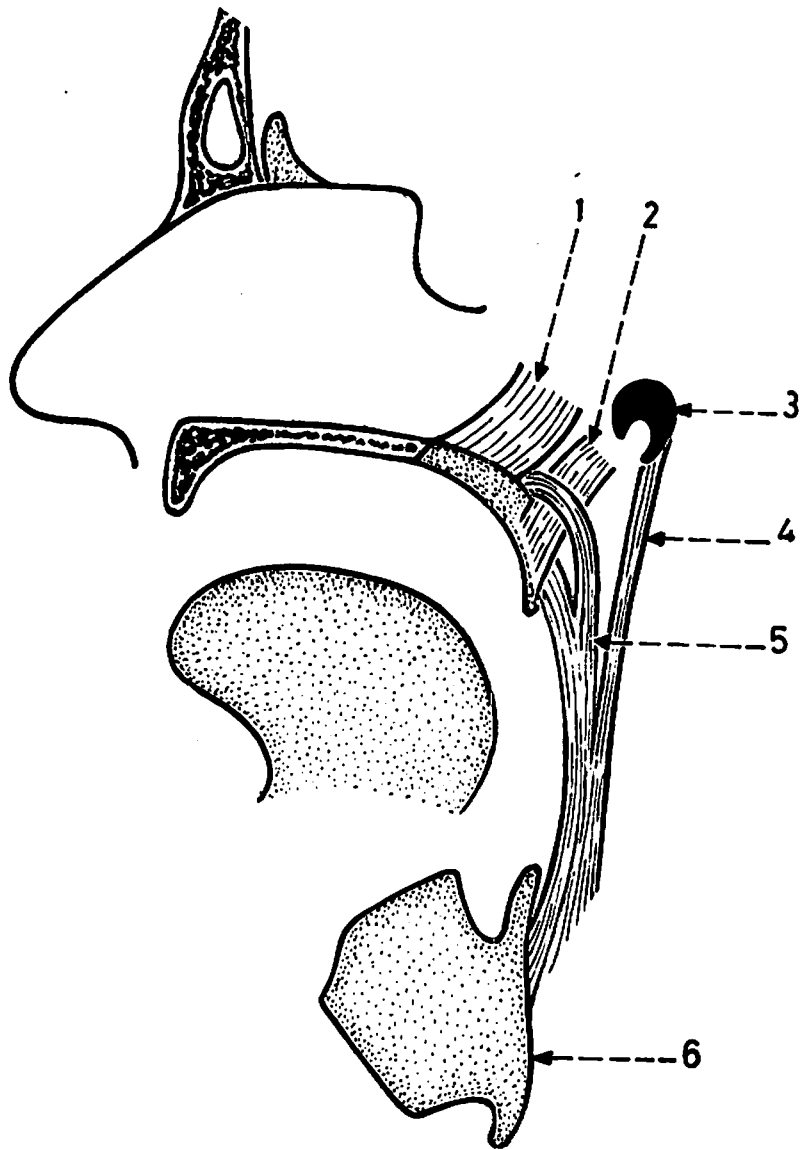


Fig.(586): PALATINE APONEUROSIS AND MUSCULUS UVULAE

The fibres of the palatine aponeurosis split medially to enclose the musculus uvulae. This muscle is a bilateral structure which arises from the posterior nasal spine and is inserted into the mucous membrane of the uvula.

1. posterior nasal spine.
2. palatine aponeurosis.
3. musculus uvulae enclosed within the palatine aponeurosis.

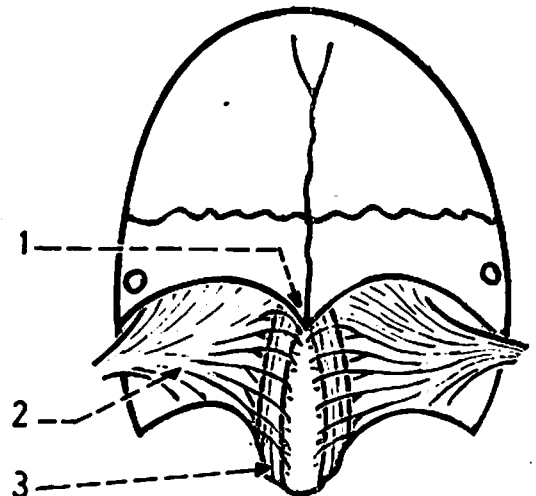


Fig.(587): ACTION OF LEVATOR PALATI MUSCLE

It elevates the soft palate and thus the pharyngeal isthmus between the nasopharynx and oropharynx is closed.

1. nasopharynx.
2. pharyngeal isthmus.
3. direction of action of levator palati.

\* Note that the tensor palati stretches the soft palate. However, the levator palati of both sides close the pharyngeal isthmus, while the palatoglossus and palatopharyngeus muscles of both sides close the oropharyngeal isthmus.

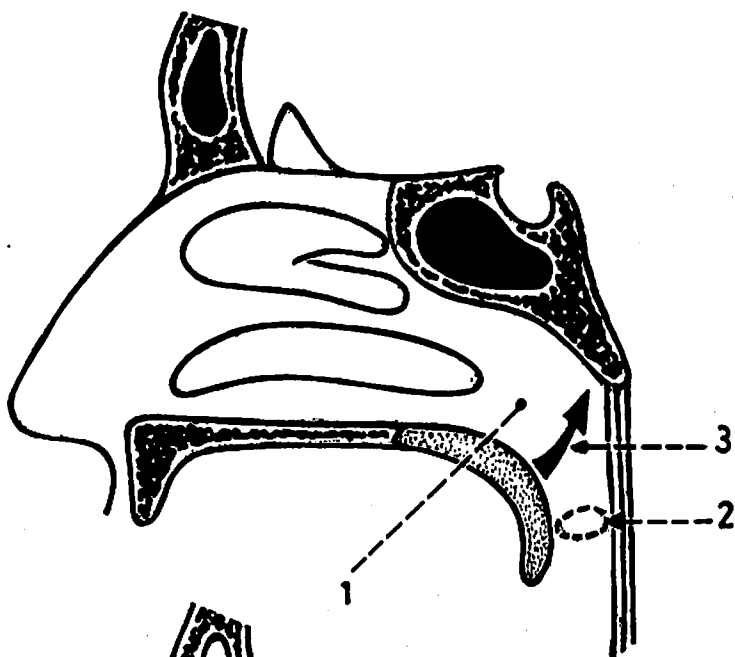


Fig.(588): NERVE SUPPLY OF PALATINE MUSCLES

All palatine muscles are supplied by the cranial root of accessory nerve (through the vagus) except the tensor palati (by the mandibular nerve).

(a) muscles supplied by cranial root of accessory (levator palati, palatoglossus, palatopharyngeus and musculus uvulae).

(b) tensor palati supplied by mandibular nerve.

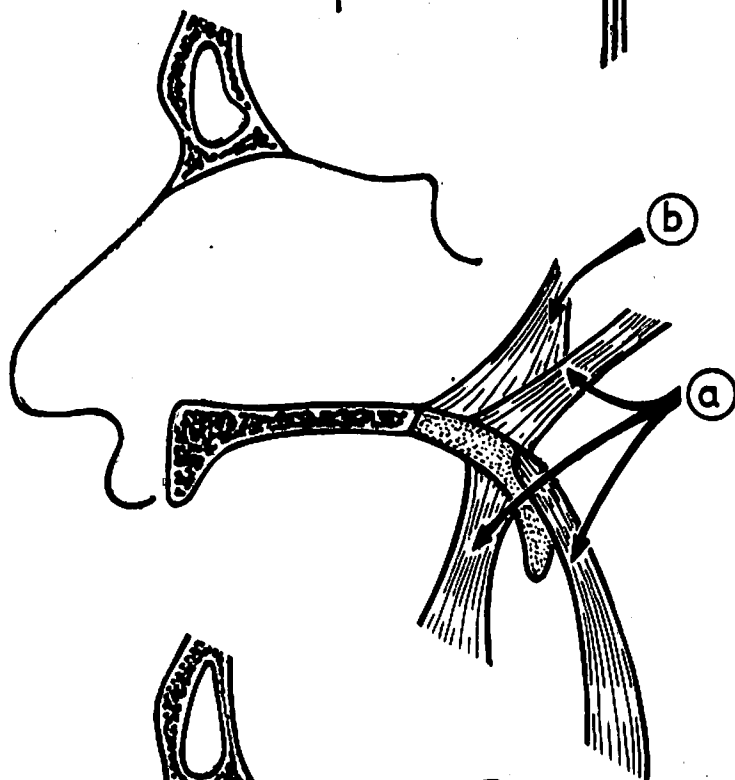
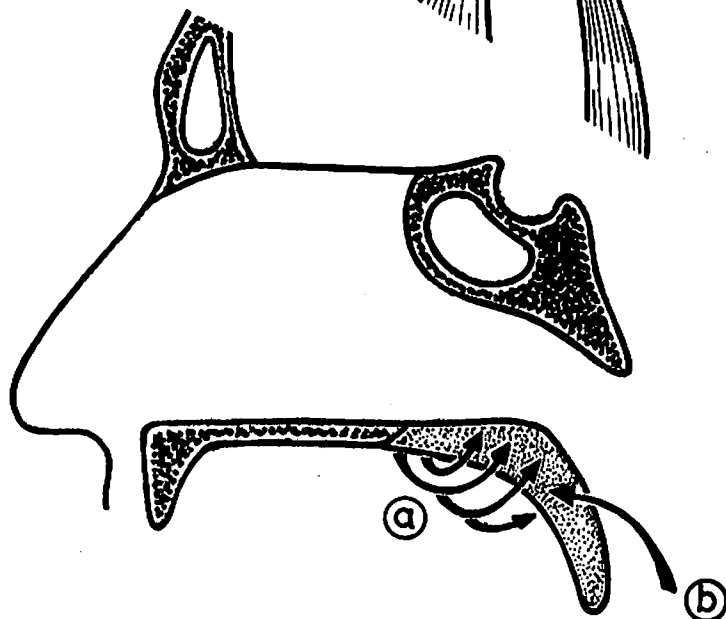


Fig.(589): SENSORY NERVES OF SOFT PALATE

These are mainly the lesser palatine nerves (from the pterygopalatine ganglion) and glossopharyngeal nerve.

(a) lesser palatine nerves.

(b) glossopharyngeal nerve.



## PALATINE TONSIL

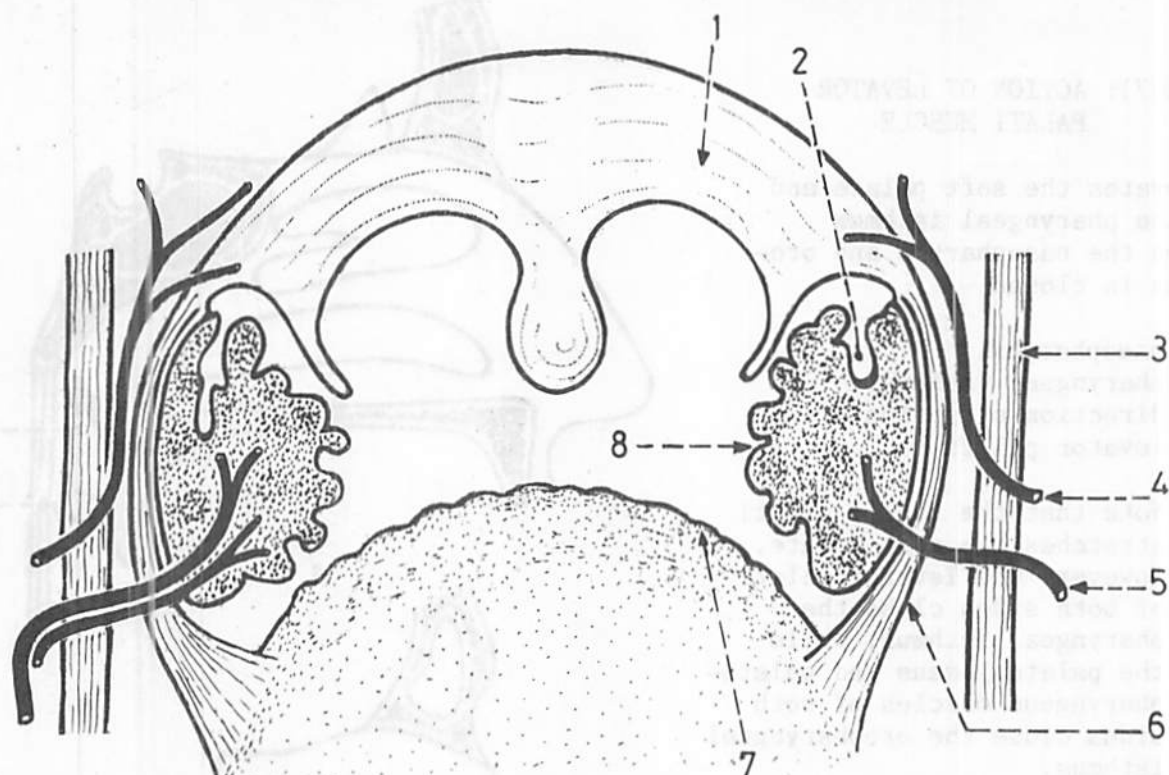


Fig.(590): POSITION OF THE PALATINE TONSIL (coronal section)

It lies in the lateral wall of the oropharynx, one on each side. Its medial surface is free, while its lateral surface is covered by a layer of fibrous tissue forming the capsule of the tonsil. It is related above to the soft palate and below to the dorsum of the tongue.

1.soft palate; 2.intratonsillar cleft; 3.superior constrictor; 4.paratonsillar vein; 5.tonsillar artery; 6.capsule of the tonsil (attached to the side of the tongue); 7.dorsum of the tongue; 8.medial surface of the tonsil showing crypts.

Fig.(591): TONSILLAR SINUS

It is a triangular recess bounded by the palatoglossal and palatopharyngeal arches and lodges the tonsil.

1. soft palate.
2. tonsillar sinus.
3. palatoglossal arch (anterior boundary of the sinus).
4. dorsum of the tongue.
5. palatine tonsil.
6. palatopharyngeal arch (posterior boundary of the sinus).

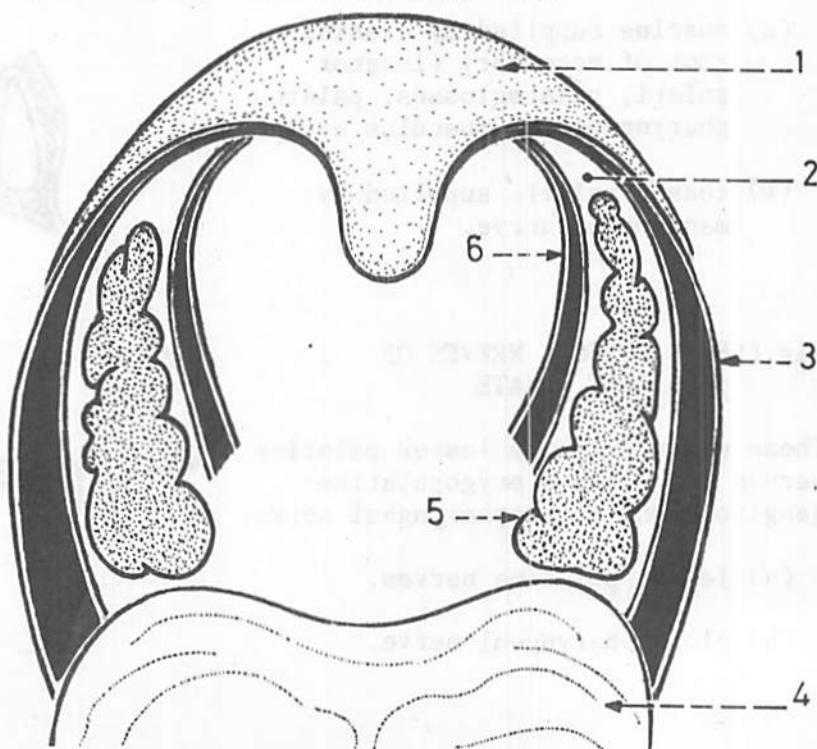


Fig.(592): LATERAL RELATIONS  
OF THE TONSIL

The tonsil is related laterally to the superior constrictor muscle which forms its bed. This muscle separates the tonsil from the ascending palatine artery and occasionally from the facial artery itself.

1. facial artery (opposite the lower part of the tonsil).
2. tonsillar artery piercing the superior constrictor.
3. outline of the tonsil.
4. ascending palatine artery.
5. superior constrictor muscle.
6. internal carotid artery (lies 1 inch behind and lateral to the tonsil).
7. external carotid artery.

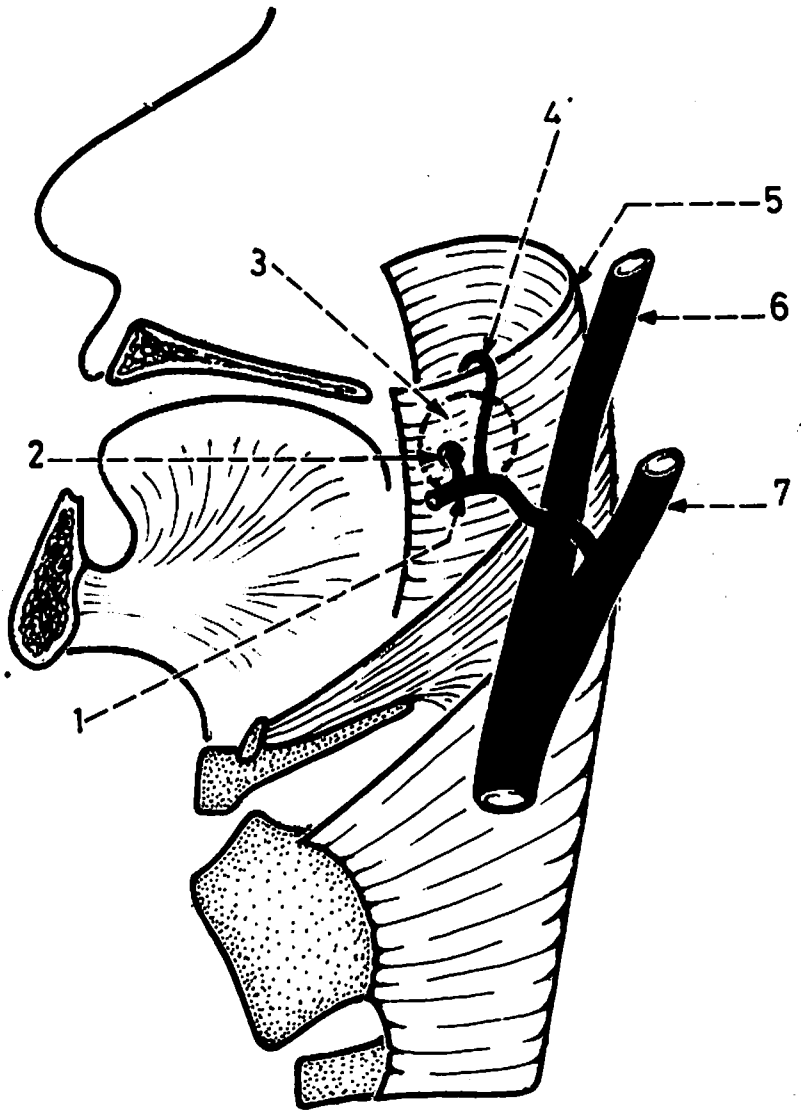


Fig.(593): SURFACE ANATOMY OF  
PALATINE TONSIL

It is represented by a rounded area over the lower part of the masseter, a little above and in front of the angle of the mandible.

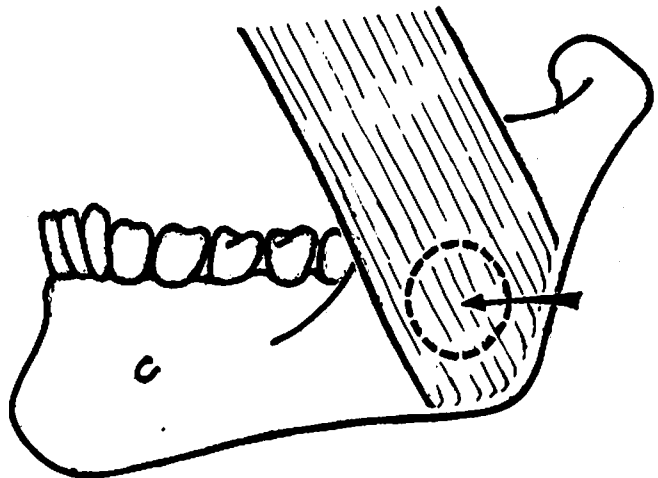


Fig.(594): VESSELS OF THE TONSIL

The chief artery of the tonsil is the tonsillar branch of the facial artery. It receives additional branches from the lingual, ascending palatine, ascending pharyngeal and greater palatine arteries.

1. tonsillar artery.
2. tonsillar vein.
3. superior constrictor muscle.

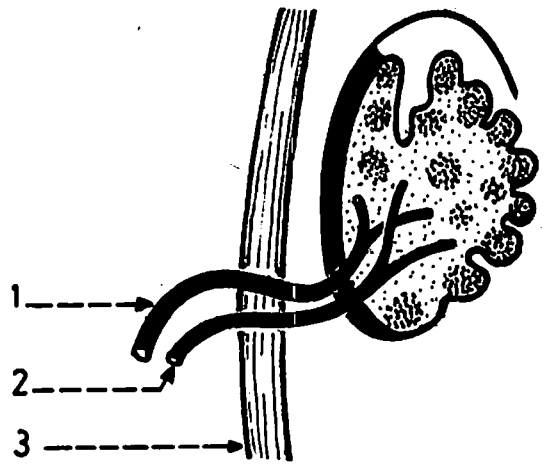


Fig.(595): SENSORY NERVES OF THE TONSIL

These are the lesser palatine and glossopharyngeal nerves.

- (a) lesser palatine nerves.
- (b) glossopharyngeal nerve.

\* Pain from tonsillitis may be referred to the middle ear through the tympanic branch of the glossopharyngeal nerve.

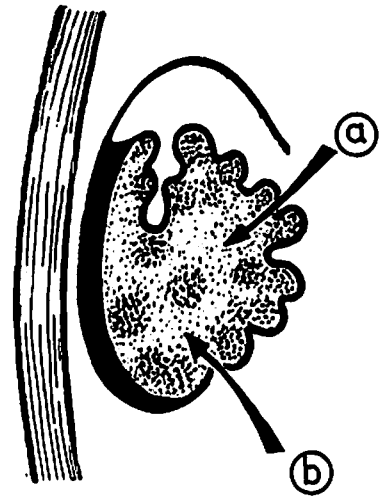
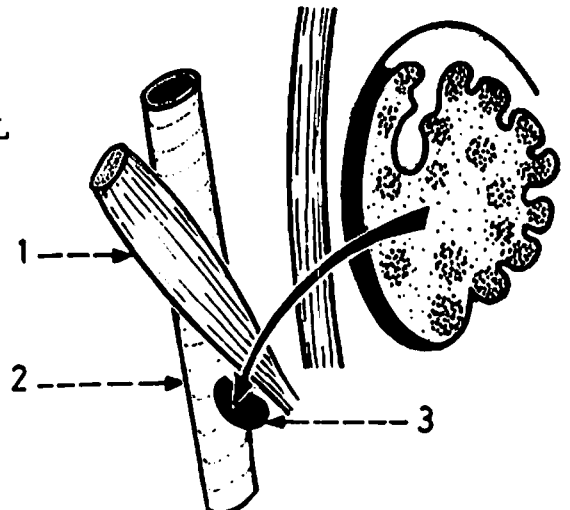


Fig.(596): LYMPHATIC DRAINAGE OF THE TONSIL

Lymph vessels from the tonsil pierce the superior constrictor to end in the upper deep cervical nodes specially the jugulo-digastric node.

1. posterior belly of digastric.
2. internal jugular vein.
3. jugulo-digastric lymph node.





# PHARYNX

Fig.(597): POSITION OF THE PHARYNX

It lies behind the nasal cavity, oral cavity and cavity of the larynx extending from the base of the skull above to the level of the 6th cervical vertebra below (opposite the cricoid cartilage).

1. base of the skull forming the roof of the pharynx.
2. lower end of the pharynx where the oesophagus begins (at the level of 6th C.V.).

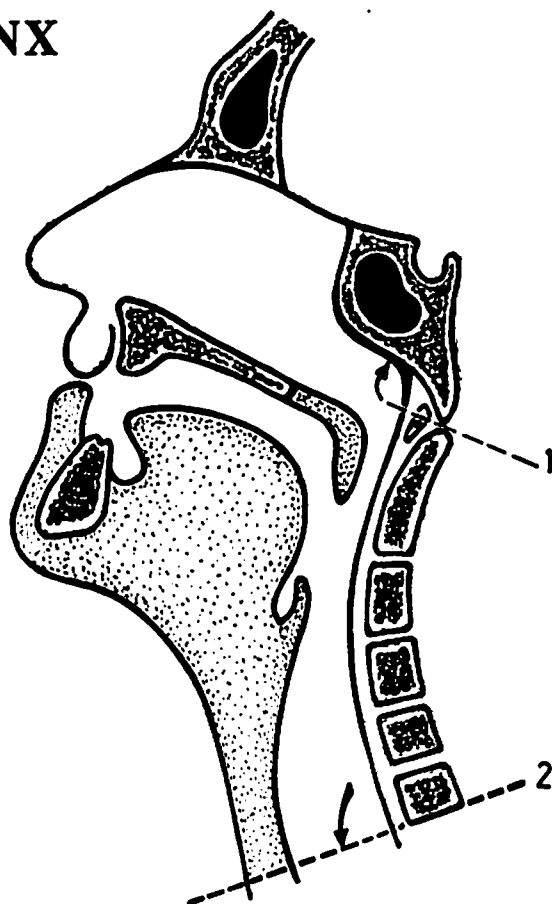


Fig.(598): PARTS OF THE PHARYNX

These are the nasopharynx, oropharynx and laryngopharynx.

1. nasopharynx: behind the nasal cavity.
2. oropharynx: behind the oral cavity.
3. laryngopharynx: behind the cavity of the larynx.

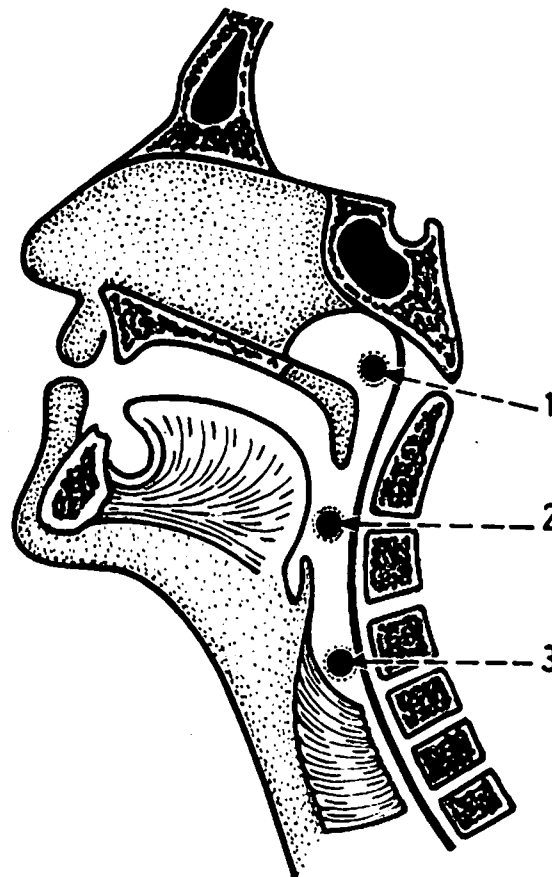


Fig.(599): STRUCTURE OF THE WALL  
OF THE PHARYNX

The wall of the pharynx consists of a thick muscle layer which is lined internally by the pharyngobasilar fascia and covered externally by the buccopharyngeal fascia.

1. cavity of the pharynx.
2. pharyngobasilar fascia.
3. muscle wall (comprises the 3 constrictors, stylopharyngeus, palatopharyngeus and salpingopharyngeus muscles).
4. buccopharyngeal fascia (covers the pharynx and extends over the buccinator).

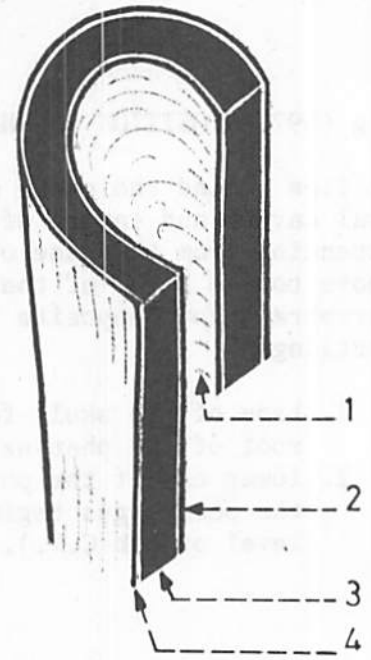


Fig.(600): STRUCTURES BEHIND  
THE PHARYNX

These are the prevertebral fascia, prevertebral muscles and the upper 6 cervical vertebrae.

1. atlas vertebra.
2. axis vertebra.
3. prevertebral muscles.
4. prevertebral fascia.
5. posterior wall of the pharynx.

\* The posterior wall of the pharynx is separated from the prevertebral fascia by the retropharyngeal space.

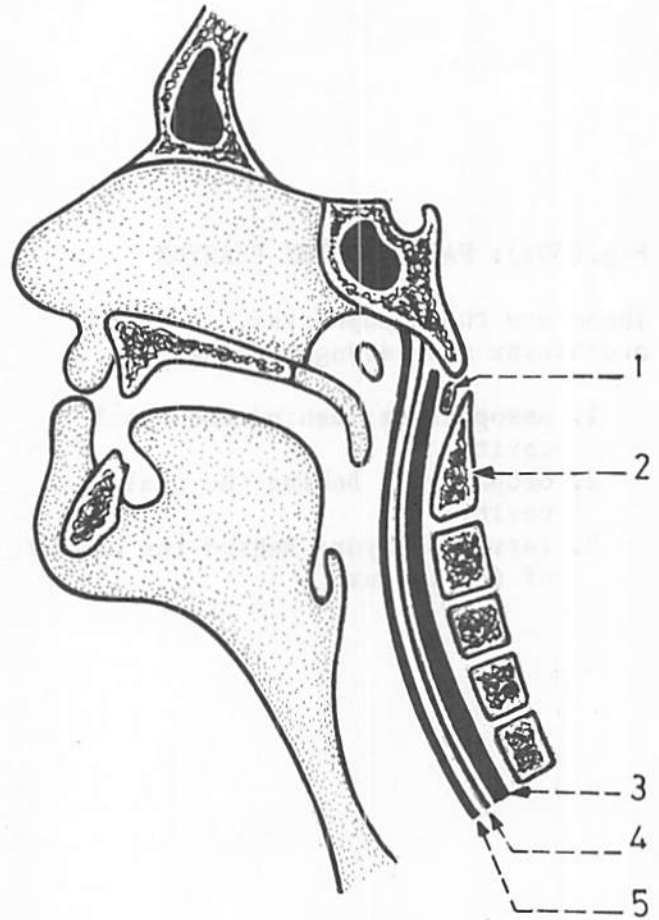


Fig.(601): POSITION OF THE NASOPHARYNX

It lies behind the nasal cavity and in front of the 1st and 2nd cervical vertebrae. Its roof is formed by the basilar part of occipital bone, and communicates below with the oropharynx through the pharyngeal isthmus.

1. posterior border of the nasal septum.
2. cavity of the nasopharynx.
3. tubal elevation in the lateral wall of the nasopharynx.
4. pharyngeal isthmus (communicates the nasopharynx with the oropharynx).

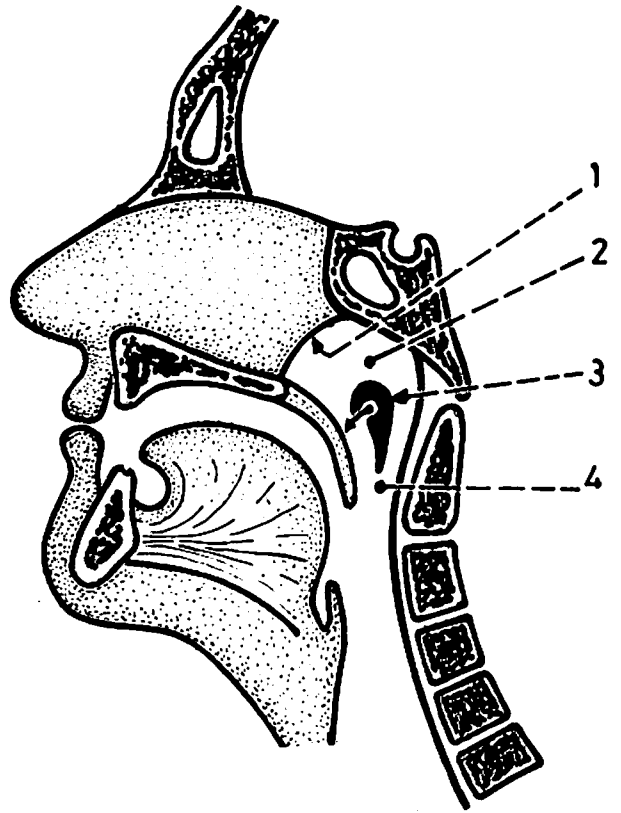


Fig.(602): COMMUNICATIONS OF THE NASOPHARYNX

It communicates in front with the nasal cavity through the posterior nasal apertures, and on each side with the middle ear through the auditory tube.

1. pharyngeal tonsil (a collection of lymphoid tissue projecting from the roof of the pharynx).
2. cavity of nasopharynx.
3. opening of auditory tube.
4. posterior nasal aperture.

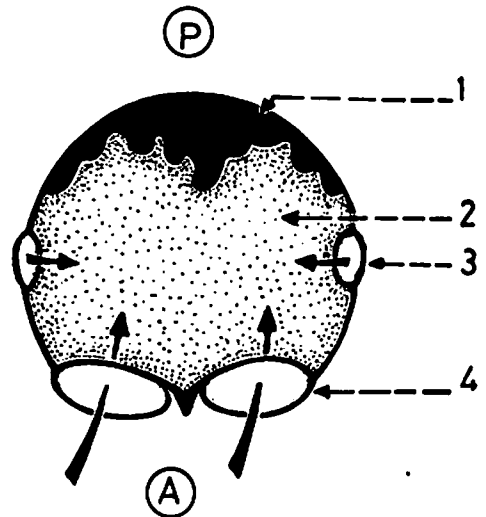


Fig.(603): FEATURES OF LATERAL WALL OF THE NASOPHARYNX

It shows the following features:  
opening of the auditory tube,  
tubal elevation, salpingo-  
pharyngeal fold and pharyngeal  
recess.

1. inferior nasal meatus (in line with the opening of the auditory tube).
2. tubal elevation (bounds the opening of the auditory tube from above and behind, and is produced by the end of the cartilage of the auditory tube).
3. pharyngeal recess (a depression behind the tubal elevation).
4. salpingopharyngeal fold (extends downwards from the tubal elevation and contains the salpingopharyngeus muscle).
5. opening of the auditory tube (lies 1 cm behind the posterior end of the inferior nasal meatus).

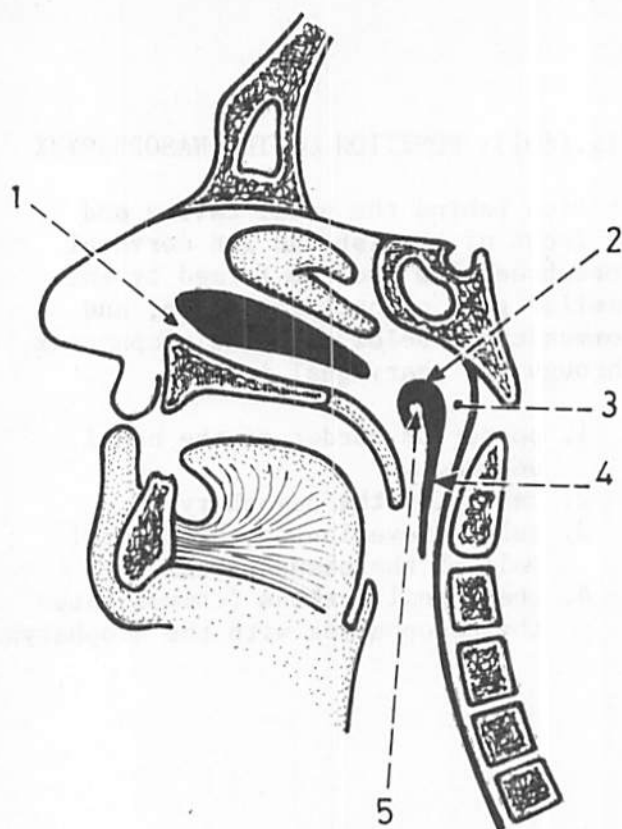
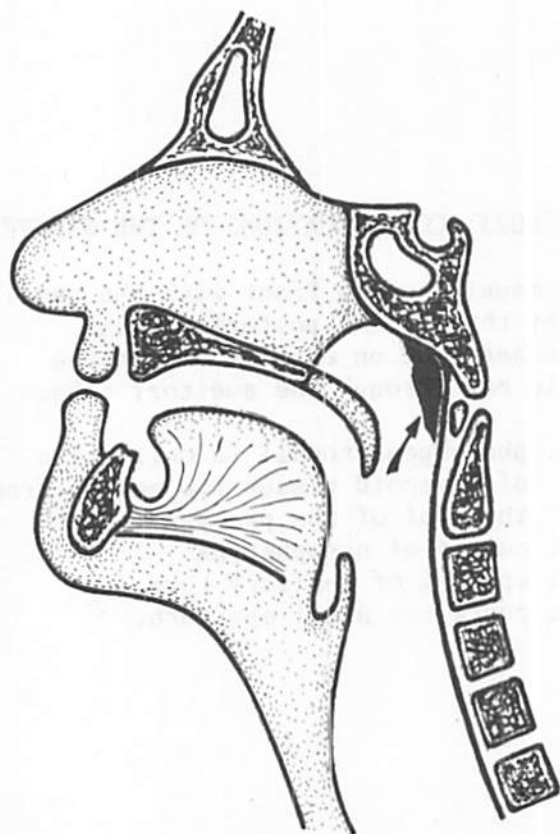


Fig.(604): PHARYNGEAL TONSIL

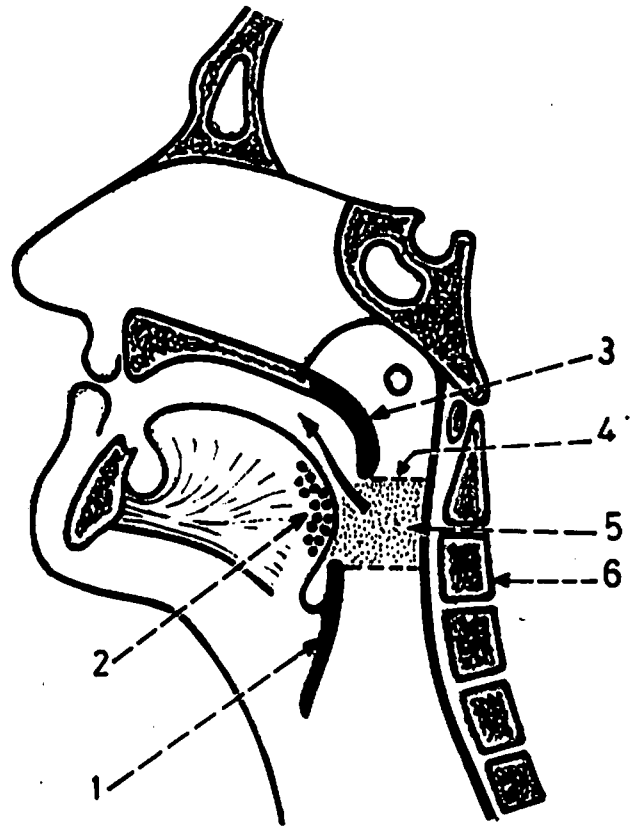
It is a collection of lymphoid tissue projecting from the roof and the adjoining part of the posterior wall of the nasopharynx. It has lateral prolongations which reach as far as the openings of the auditory tubes. It is well developed in children, and if enlarged it obstructs the auditory opening and the posterior nasal apertures.



**Fig.(605): POSITION AND COMMUNICATIONS OF THE OROPHARYNX**

The oropharynx extends from the soft palate above to the upper border of the epiglottis below. It communicates in front with the oral cavity through the oropharyngeal isthmus, and above with the nasopharynx through the pharyngeal isthmus.

1. epiglottis.
2. pharyngeal part of the dorsum of the tongue containing the lingual tonsil.
3. soft palate.
4. pharyngeal isthmus.
5. oropharynx (opposite the 2nd and 3rd cervical vertebrae).
6. 3rd cervical vertebra.



**Fig.(606): FEATURES OF LATERAL WALL OF OROPHARYNX**

The lateral wall presents the palatine tonsil and the palatopharyngeal arch.

1. palatine tonsil in the tonsillar sinus.
2. palatopharyngeal arch (a fold of mucous membrane containing the palatopharyngeus muscle).

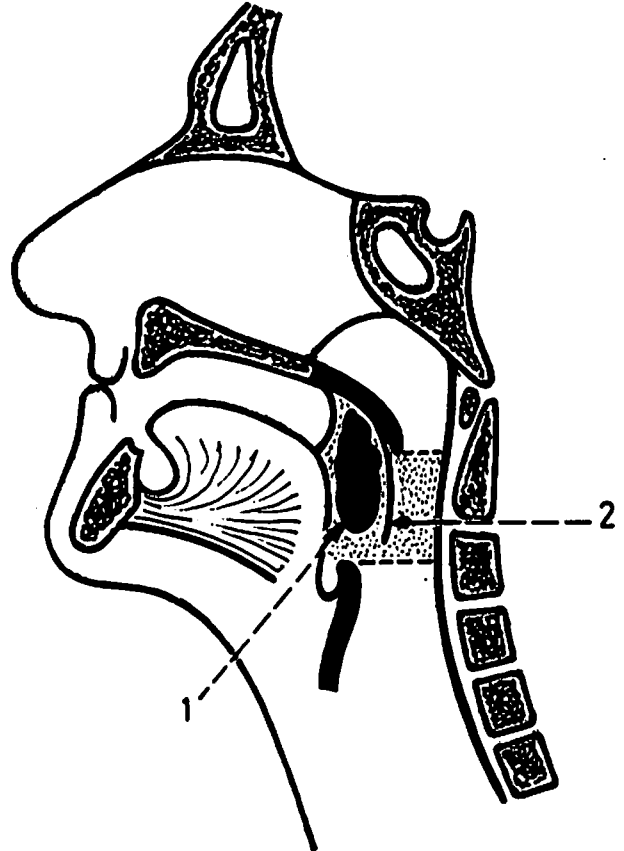


Fig.(607): WALDEYER'S RING

This is a ring of lymphoid tissue formed of separate masses (or tonsils) arranged as follows: palatine tonsils (one on each side of the oropharynx), pharyngeal tonsil (in the roof and posterior wall of the nasopharynx) and lingual tonsil (in the pharyngeal part of the dorsum of the tongue).

1. pharyngeal tonsil (extends laterally as far as the auditory tubes).
2. auditory tube.
3. palatine tonsil.
4. lingual tonsil.
5. soft palate.

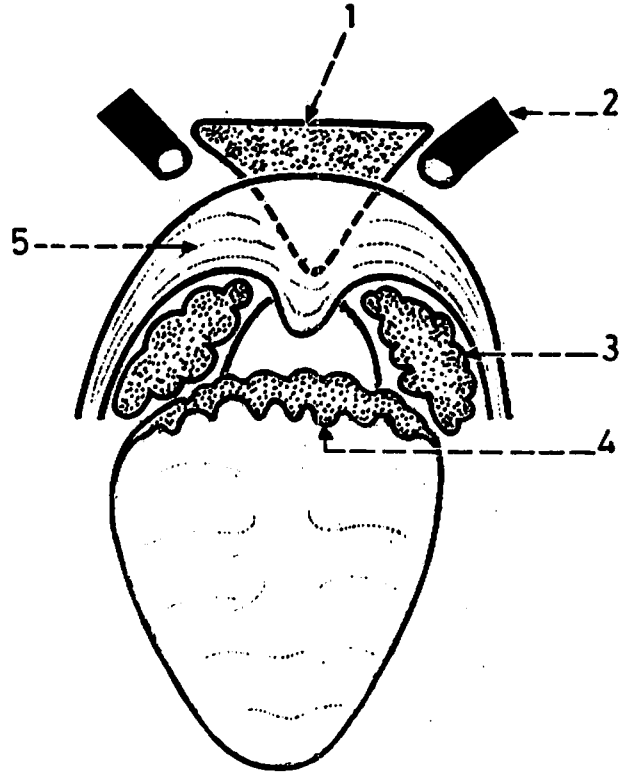


Fig.(608): LARYNGOPHARYNX

It extends from the upper border of the epiglottis to the lower border of the cricoid cartilage. Its anterior wall is formed by the inlet of the larynx above and back of the cricoid cartilage below. Its posterior wall is related to the cervical vertebrae from 3 to 6.

1. epiglottis.
2. cricoid cartilage (posterior part).
3. 6th cervical vertebra.
4. inlet of the larynx.
5. laryngopharynx.
6. 3rd cervical vertebra.

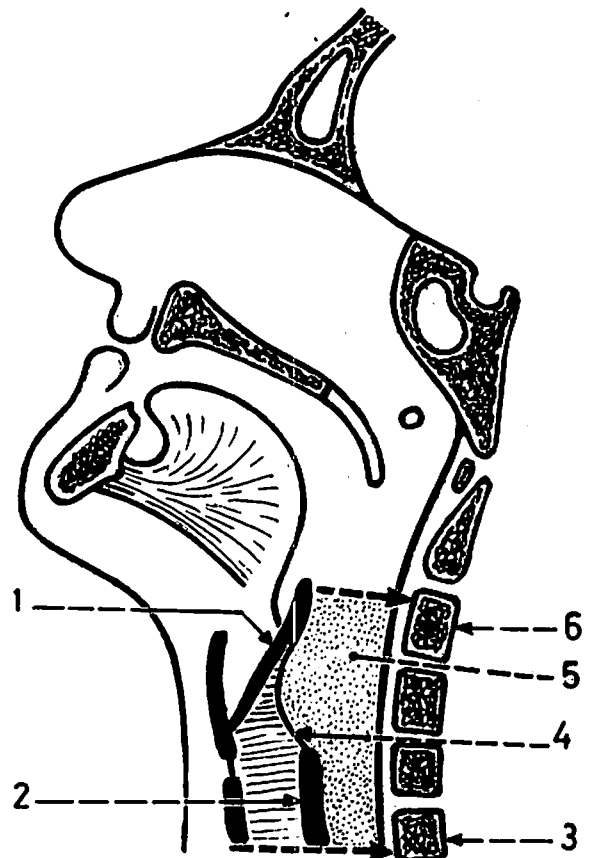
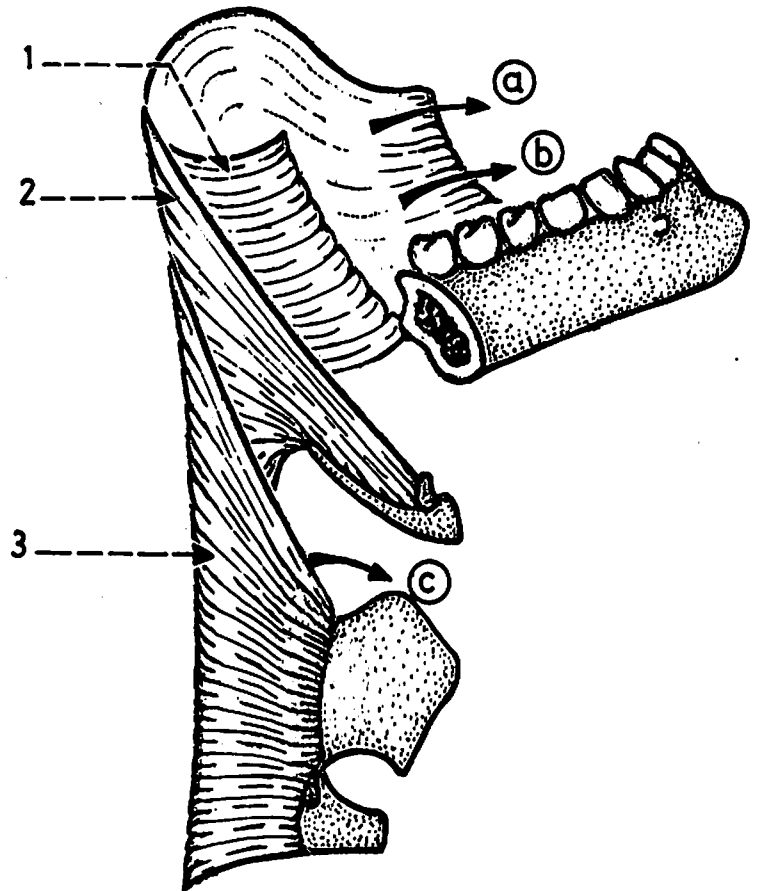


Fig.(609): CONSTRICTOR MUSCLES  
OF THE PHARYNX  
(side view)

These are the superior, middle and inferior constrictors. The muscles of both sides are continuous together posteriorly at the median fibrous raphe, but not anteriorly. As a result, the anterior wall of the pharynx is deficient where it communicates with the nasal cavity, oral cavity and cavity of the larynx.



1. superior constrictor.
2. middle constrictor.
3. inferior constrictor.

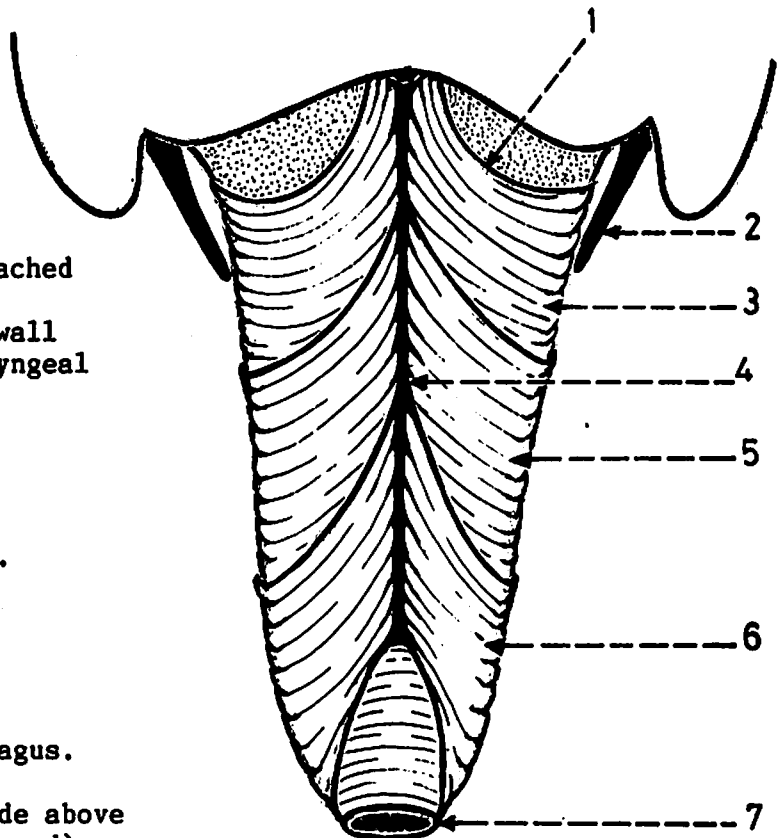
(a) communication with the nasal cavity.

(b) communication with the oral cavity.

(c) communication with the cavity of the larynx.

Fig.(610): CONSTRICTOR MUSCLES  
OF THE PHARYNX  
(posterior view)

The muscles of both sides are attached to the median fibrous raphe which extends upwards in the posterior wall of the pharynx as far as the pharyngeal tubercle.



1. upper curved border of superior constrictor.
2. styloid process on the side of the superior constrictor.
3. superior constrictor.
4. median fibrous raphe.
5. middle constrictor.
6. inferior constrictor.
7. lower end of the pharynx and beginning of the oesophagus.

\* Note that the pharynx is wide above and narrow below (funnel-shaped).

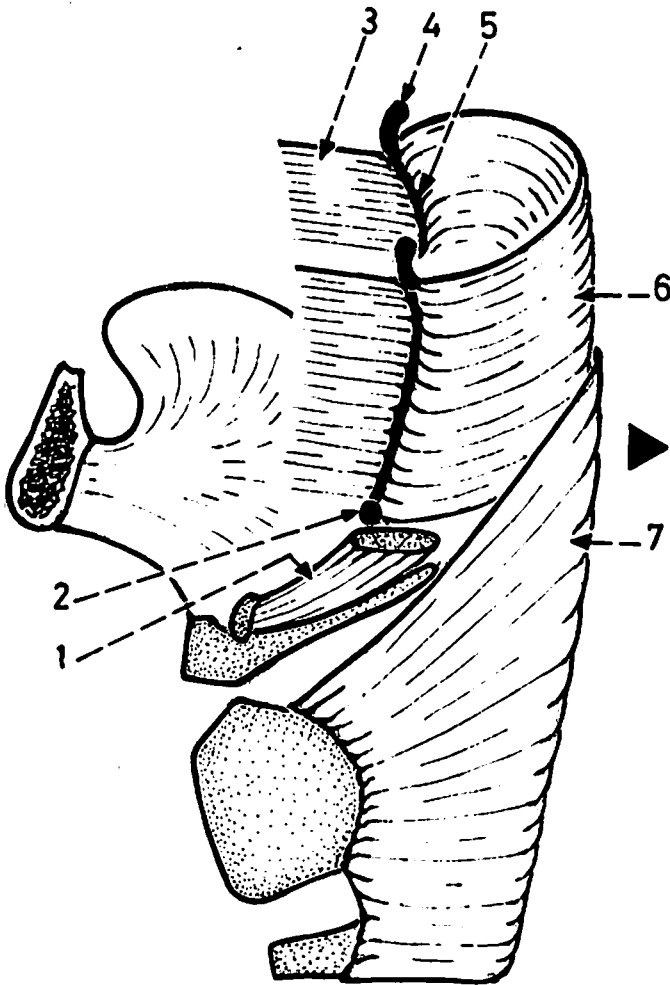


Fig.(611): ORIGIN OF SUPERIOR CONSTRICTOR MUSCLE

It arises from the pterygoid hamulus, pterygomandibular ligament and posterior end of mylohyoid line.

1. middle constrictor (cut).
2. posterior end of mylohyoid line.
3. buccinator muscle.
4. pterygoid hamulus.
5. pterygomandibular raphe.
6. superior constrictor muscle (quadrilateral in shape).
7. inferior constrictor muscle.

\* All the 3 constrictors are inserted posteriorly into the median fibrous raphe.

Fig.(612): RELATIONS OF SUPERIOR CONSTRICTOR MUSCLE

The upper border is related to the auditory tube and levator palati, while the lower border is related to the glossopharyngeal nerve and stylopharyngeus.

1. auditory tube.
2. levator palati.
3. free upper border of superior constrictor.
4. stylopharyngeus muscle.
5. glossopharyngeal nerve.
6. middle constrictor.
7. inferior constrictor.

\* The upper border of the superior constrictor is free and curves below the levator palati and auditory tube.

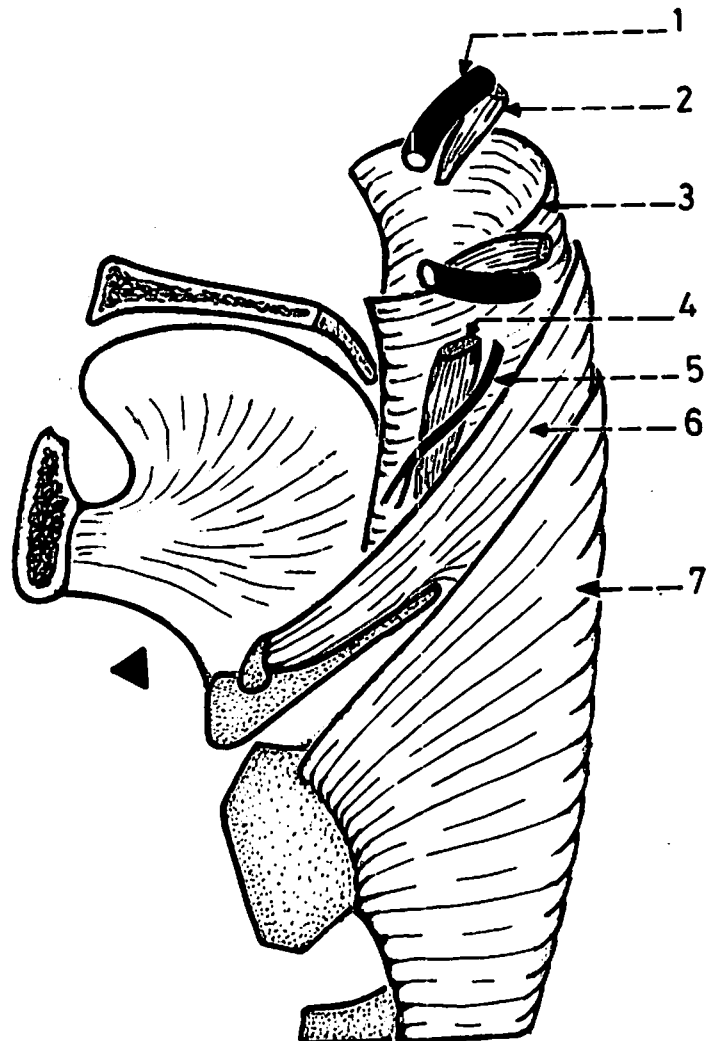




Fig.(613): ORIGIN OF MIDDLE  
CONSTRICTOR MUSCLE

It arises from the greater horn and lesser horn of hyoid bone and from the lower part of the stylohyoid ligament. The muscle is fan-shaped.

1. cricoid cartilage.
2. thyroid cartilage.
3. greater horn of hyoid bone.
4. lesser horn of hyoid bone.
5. stylohyoid ligament.
6. middle constrictor.
7. inferior constrictor.

\* The middle constrictor overlaps the lower part of the superior constrictor, but it is overlapped by the inferior constrictor.

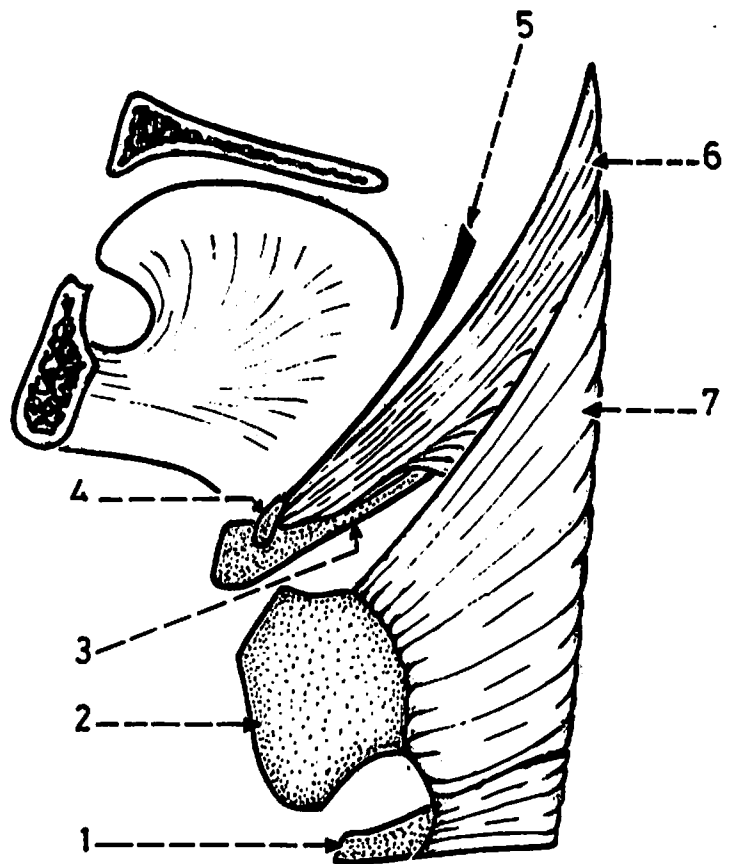
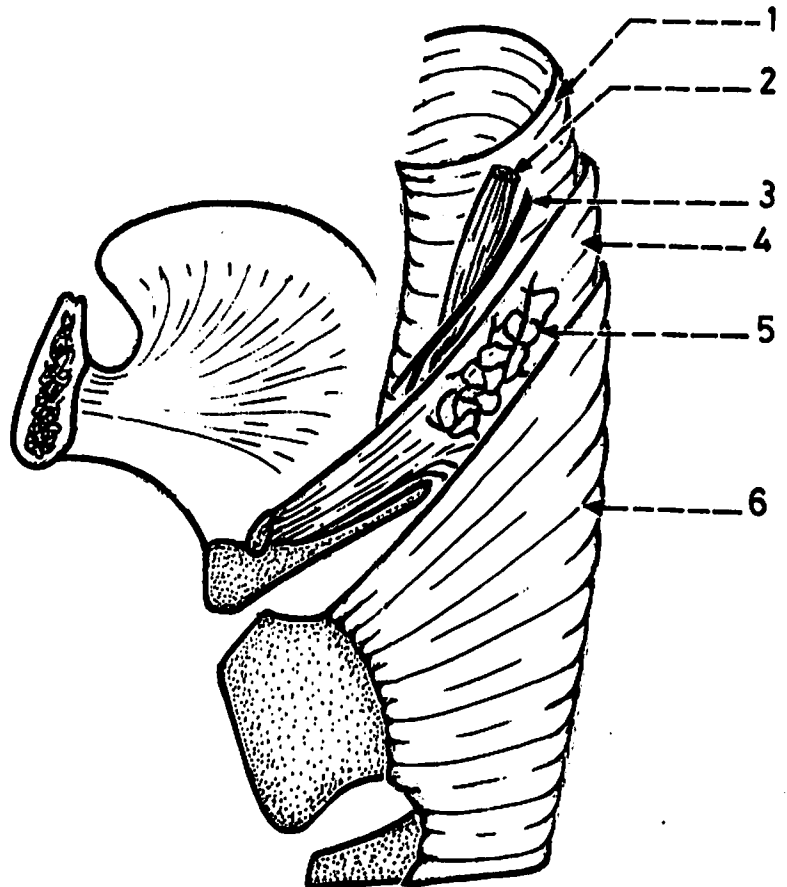


Fig. (614): RELATIONS OF MIDDLE  
CONSTRICTOR MUSCLE

The pharyngeal plexus lies on the side of the muscle, while the glossopharyngeal nerve and stylopharyngeus muscle pass in the interval between the middle and superior constrictors.

1. superior constrictor (overlapped by the middle constrictor).
2. stylopharyngeus muscle.
3. glossopharyngeal nerve.
4. middle constrictor (overlapped by the inferior constrictor).
5. pharyngeal plexus of nerves.
6. inferior constrictor.

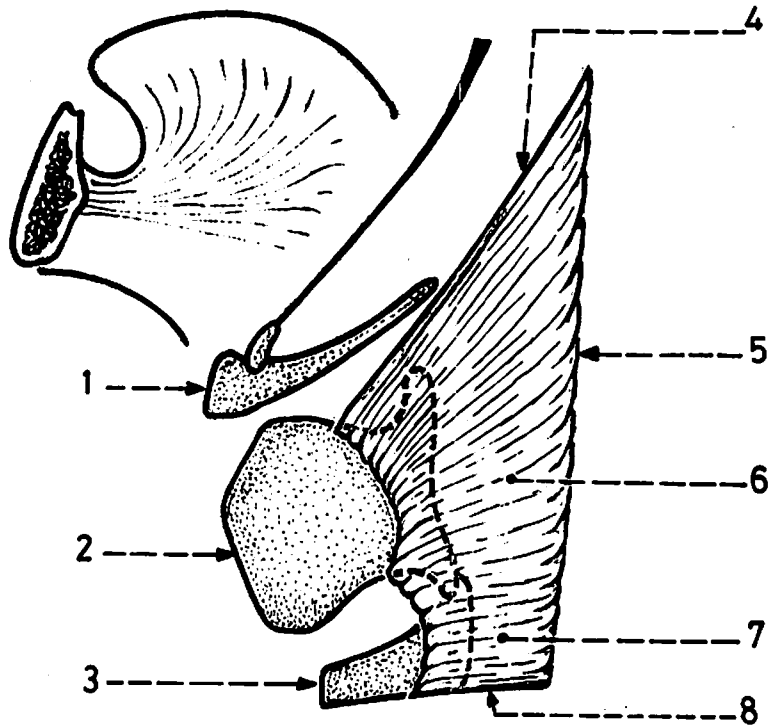


**Fig.(615): ORIGIN OF INFERIOR CONSTRUCTOR MUSCLE**

It arises from the oblique line of thyroid cartilage, inferior horn of thyroid cartilage, fibrous arch bridging over the cricothyroid muscle and side of the cricoid cartilage.

The part from the thyroid cartilage is called thyropharyngeus, while the part from the cricoid cartilage is called cricopharyngeus.

1. hyoid bone.
2. thyroid cartilage.
3. cricoid cartilage.
4. upper oblique border of inferior constrictor.
5. insertion of inferior constrictor into the median fibrous raphe.
6. thyropharyngeus part of the muscle.
7. cricopharyngeus part of the muscle.



**Fig.(616): SITES OF ORIGIN OF INFERIOR CONSTRUCTOR MUSCLE**

1. cricothyroid muscle.
2. origin from the oblique line of thyroid cartilage.
3. origin from the fibrous arch bridging over the cricothyroid muscle.
4. origin from the inferior horn of thyroid cartilage.
5. cricoid cartilage.
6. origin from the side of cricoid cartilage (cricopharyngeus part).

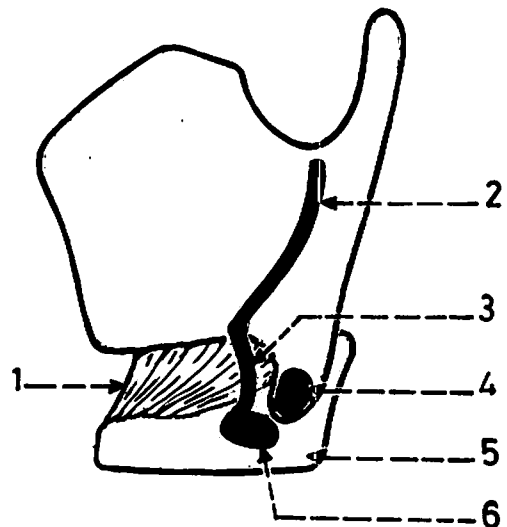


Fig.(617): NERVES AND VESSELS RELATED TO THE INFERIOR CONSTRICTOR

The internal laryngeal nerve and superior laryngeal artery run between the middle and inferior constrictors, while the recurrent laryngeal nerve and inferior laryngeal artery ascend deep to the lower border of the inferior constrictor.

1. thyrohyoid membrane.
2. middle constrictor.
3. superior laryngeal nerve.
4. internal laryngeal nerve.
5. superior laryngeal artery.
6. external laryngeal nerve crossing over the side of the muscle.
7. thyropharyngeus part of inferior constrictor.
8. cricopharyngeus part of inferior constrictor.
9. recurrent laryngeal nerve.
10. inferior laryngeal artery.

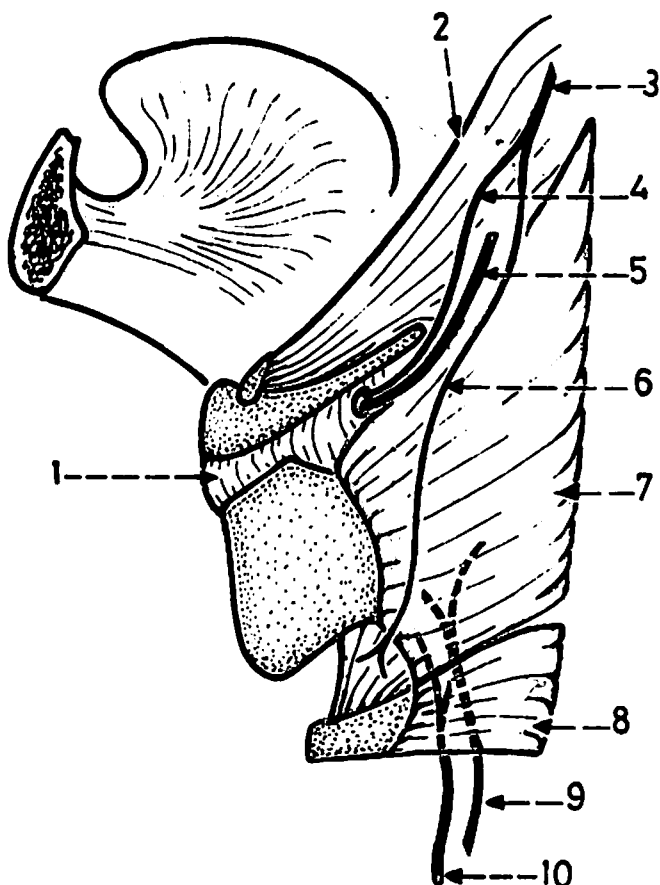


Fig.(618): NERVE SUPPLY OF THE PHARYNX

As a rule all muscles of the pharynx are supplied by fibres from the cranial root of accessory (through the pharyngeal plexus) except the stylopharyngeus which is supplied by the glossopharyngeal nerve.

As regards the sensory supply, the nasopharynx is supplied by branches from the maxillary nerve through the pterygo-palatine ganglion, the oropharynx from the glossopharyngeal nerve while the laryngopharynx from the vagus.

1. glossopharyngeal nerve.
2. sympathetic trunk.
3. vagus nerve.
4. pharyngeal plexus (contains sensory, motor and sympathetic fibres).
5. additional nerve supply to the inferior constrictor from the recurrent laryngeal nerve.

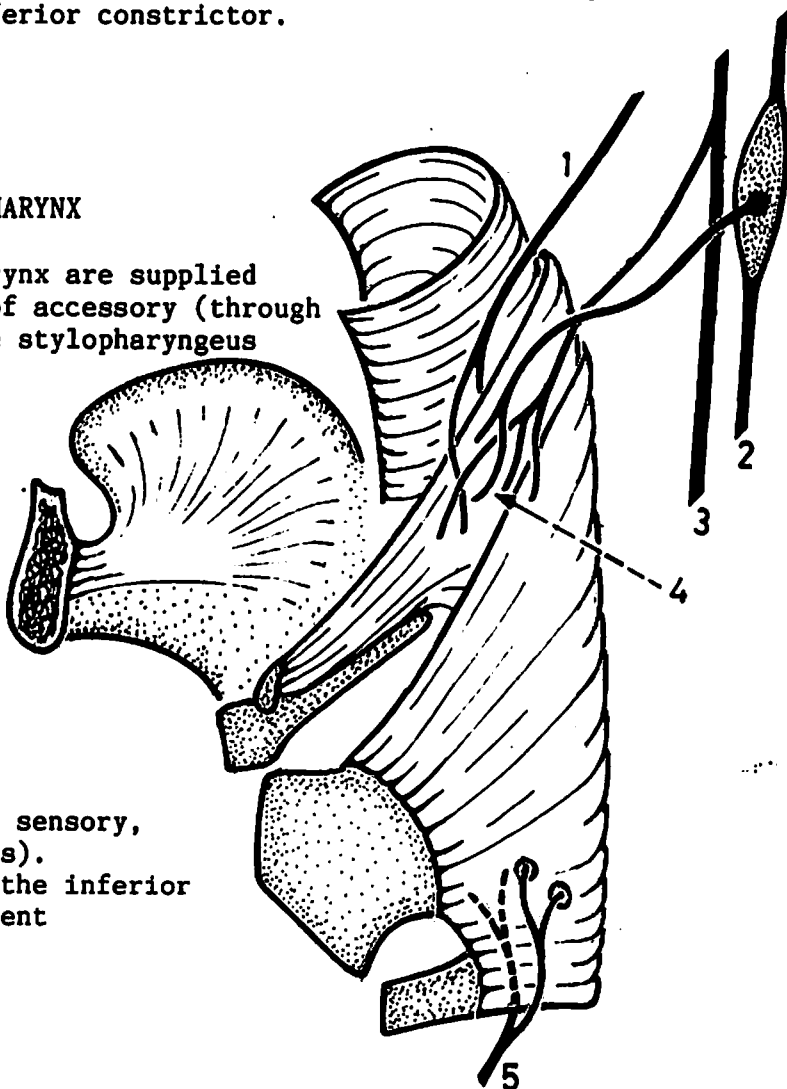


Fig.(619): ARTERIES OF THE PHARYNX

The pharynx gets blood supply from the ascending pharyngeal, facial (ascending palatine and tonsillar), maxillary (pharyngeal and artery of pterygoid canal) and lingual (dorsal lingual branches).

1. dorsal lingual branches.
2. ascending palatine artery.
3. tonsillar artery.
4. ascending pharyngeal artery.
5. facial artery.
6. lingual artery.

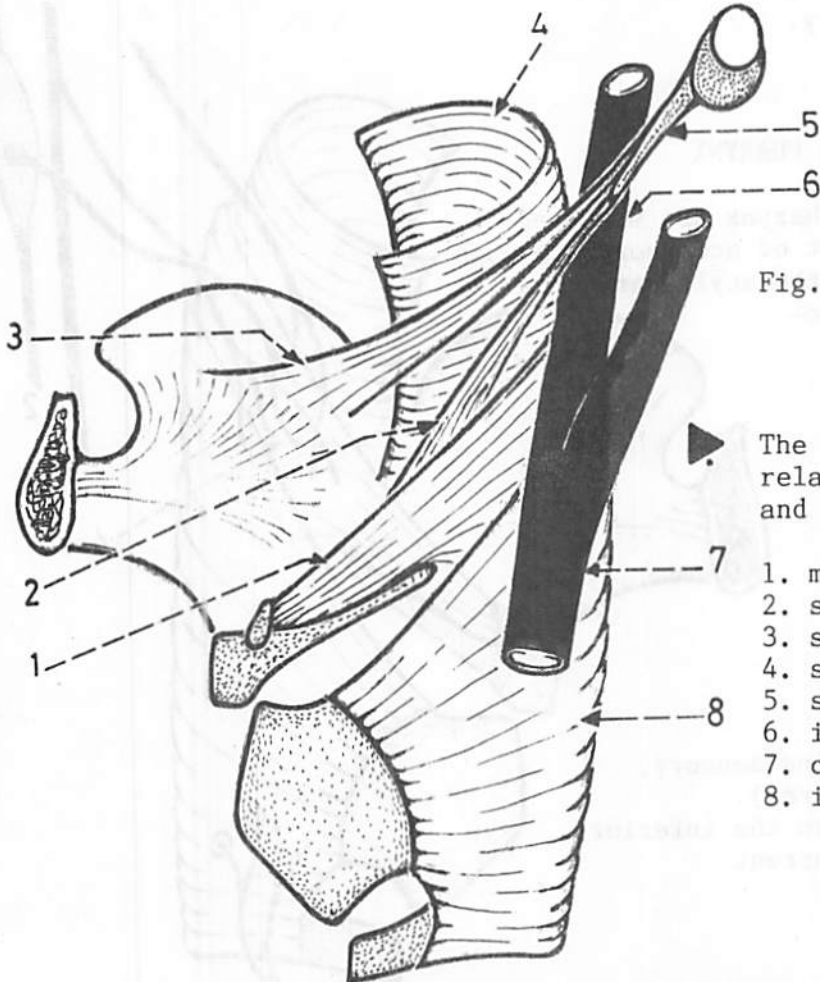
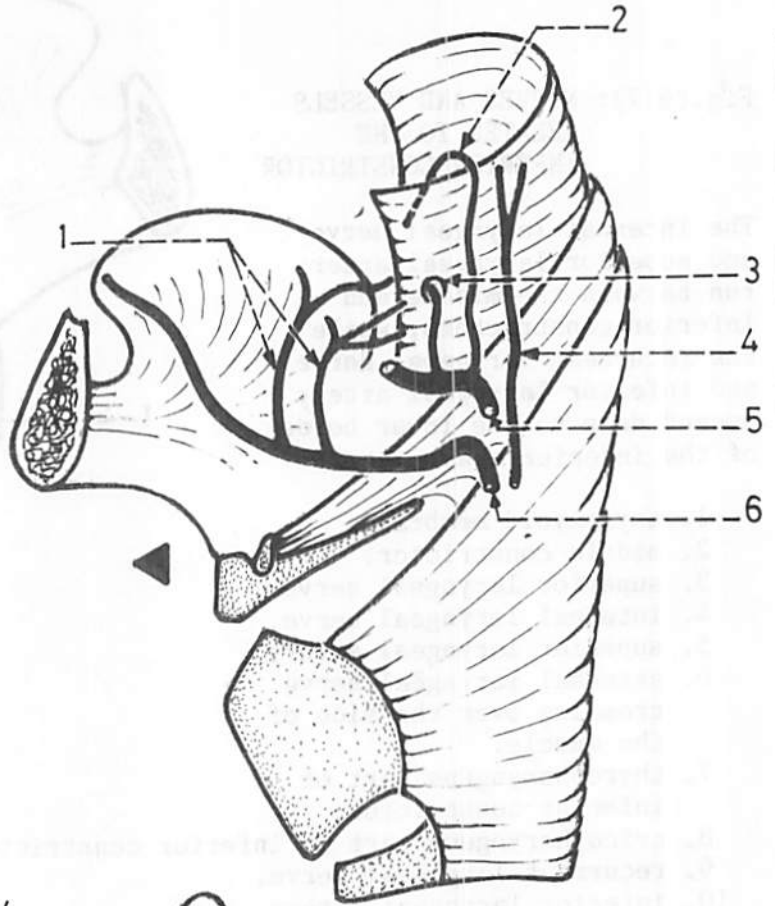


Fig.(620): RELATIONS OF THE PHARYNX TO STYLOID PROCESS AND CAROTID ARTERIES

The side of the pharynx is related to the carotid sheath and the styloid apparatus.

1. middle constrictor.
2. stylopharyngeus.
3. styloglossus.
4. superior constrictor.
5. styloid process.
6. internal carotid artery.
7. common carotid artery.
8. inferior constrictor.

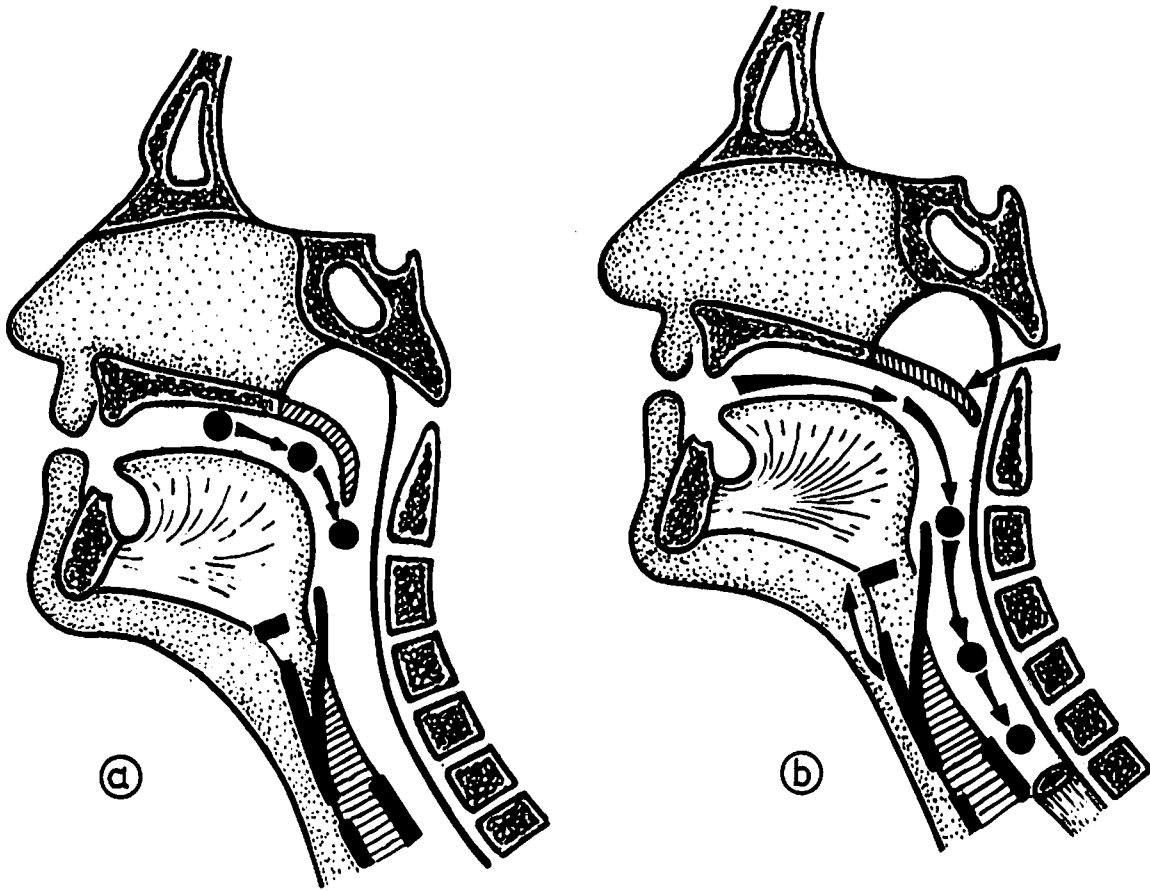
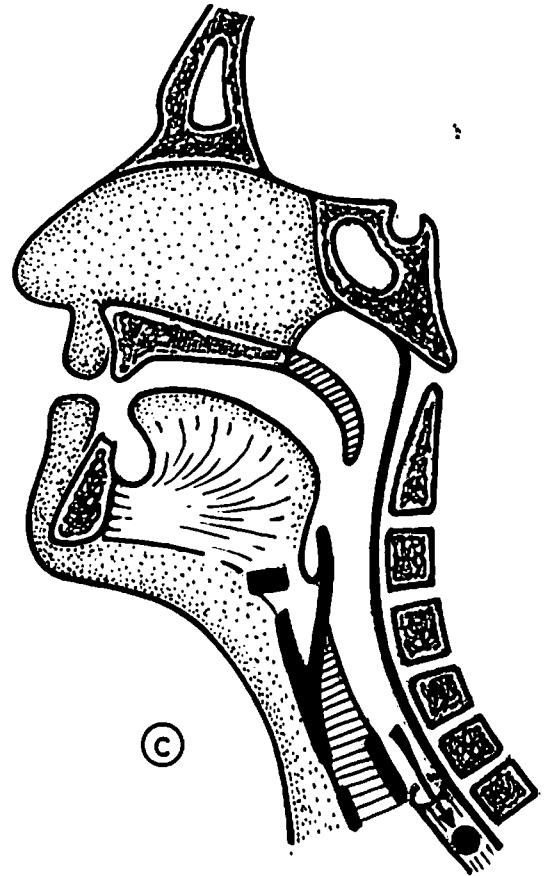


Fig.(621): STAGES OF DEGLUTITION

- (a) 1st stage (voluntary): the bolus is pushed backwards towards the pharynx. This takes place by raising the tongue and the floor of the mouth.
- (b) 2nd stage (involuntary): the bolus passes downwards into the laryngopharynx. The bolus is prevented from entering the nasopharynx by closure of the pharyngeal isthmus and from entering the larynx by closure of its inlet.
- (c) 3rd stage (involuntary): the cricopharyngeus part of the inferior constrictor relaxes and the bolus is pushed into the oesophagus.



# LARYNX

Fig.(622): SKELETON OF THE LARYNX

The skeleton of the larynx consists of a number of cartilages which are connected together by ligaments and membranes. These cartilages are 3 single (thyroid, cricoid and epiglottis) and 3 paired (arytenoid, corniculate and cuneiform). The highest limit of the larynx corresponds to the tip of the epiglottis, while the lowest limit corresponds to the lower border of the cricoid cartilage.

1. thyroid cartilage.
2. cricothyroid ligament.
3. cricoid cartilage.
4. hyoid bone.
5. thyrohyoid membrane.
6. superior horn of thyroid cartilage.
7. inferior horn of thyroid cartilage.

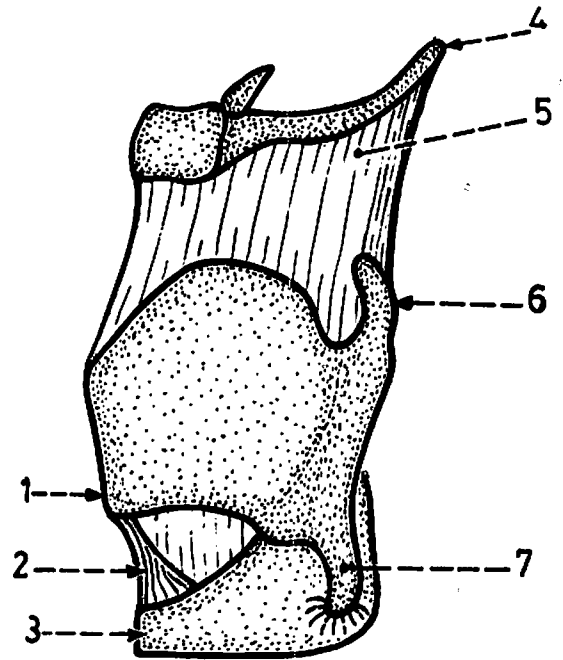
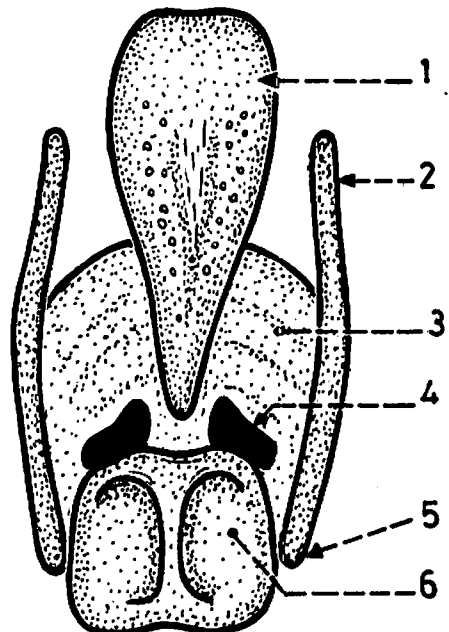


Fig.(623): SKELETON OF THE LARYNX  
AS SEEN FROM BEHIND

Looking at the skeleton of the larynx from behind the following structures are seen: inner surface and the free posterior borders of the 2 laminae of the thyroid cartilage, epiglottis, posterior part of the cricoid cartilage, and the 2 arytenoid cartilages.

1. epiglottis.
2. superior horn of thyroid cartilage.
3. inner surface of thyroid cartilage.
4. arytenoid cartilage.
5. inferior horn of thyroid cartilage.
6. posterior quadrate part of the cricoid cartilage.



\* The corniculate and cuneiform cartilages are not shown in the figure.

\* The hyoid bone is not a part of the skeleton of the larynx.

## CARTILAGES OF THE LARYNX

Fig.(624): THYROID CARTILAGE  
(anterior aspect)

It is the largest cartilage of the larynx and consists of 2 laminae which are fused anteriorly at an angle but are separated from each other posteriorly.

1. thyroid notch (a median notch on the upper border of the cartilage).
2. superior horn (upward prolongation of the posterior border).
3. thyroid lamina.
4. inferior horn (downward prolongation of the posterior border).
5. laryngeal prominence (Adam's apple).

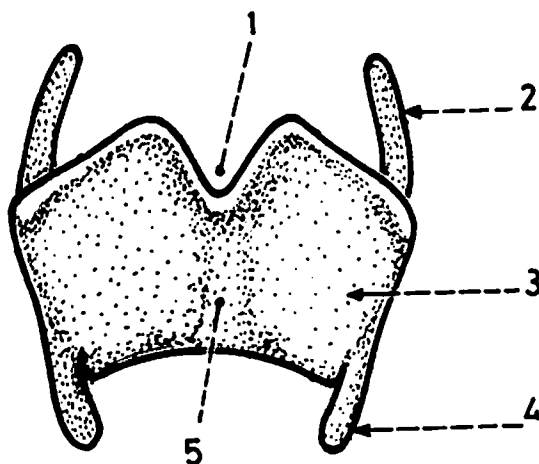


Fig.(625): THYROID CARTILAGE  
(lateral aspect)

1. lamina of thyroid cartilage.
2. laryngeal prominence (formed by union of the anterior borders of the 2 laminae).
3. superior horn.
4. oblique line (runs downwards and forwards).
5. inferior horn.

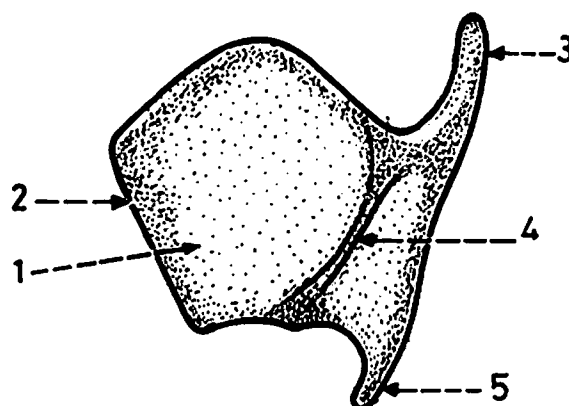


Fig.(626): MUSCLES ATTACHED TO  
THE THYROID LAMINA

1. origin of thyrohyoid muscle (from the oblique line).
2. insertion of sternothyroid muscle (into the oblique line).
3. origin of inferior constrictor (from the oblique line).
4. insertion of palatopharyngeus, stylopharyngeus and salpingopharyngeus (into the posterior border).
5. insertion of cricothyroid muscle (into the lower border).

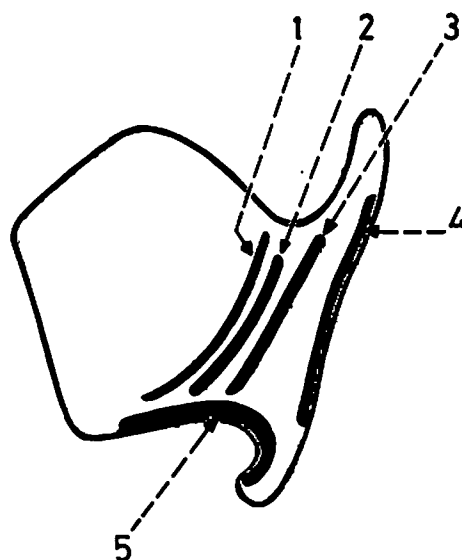
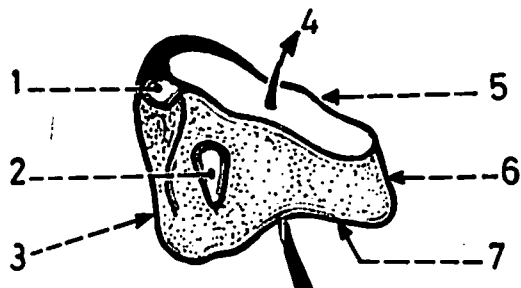


Fig.(627): CRICOID CARTILAGE

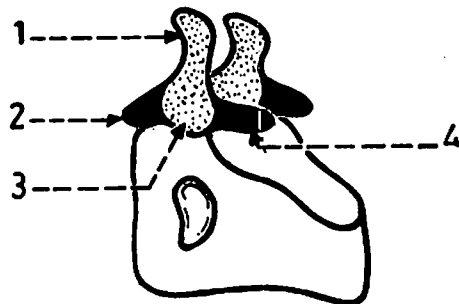
It is shaped like a signet ring and consists of a quadrate posterior lamina and a narrow anterior arch. It forms the lower part of the larynx, and articulates on each side with the arytenoid cartilage and the inferior horn of thyroid cartilage.



1. facet for arytenoid cartilage.
2. facet for inferior horn of thyroid cartilage.
3. posterior lamina.
4. arrow in the ring.
5. oblique upper border.
6. narrow anterior arch.
7. horizontal lower border.

Fig.(628): ARYTENOID CARTILAGES

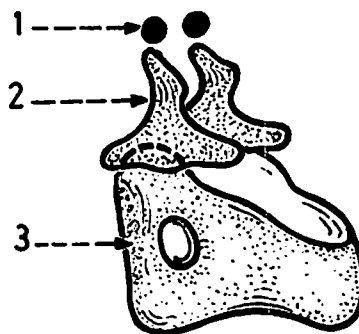
These are a pair of cartilages placed, one on each side, on the upper border of the lamina of the cricoid cartilage. Each cartilage has an apex directed upwards, a muscular process directed laterally and a vocal process directed forwards.



1. apex of arytenoid cartilage.
2. muscular process of arytenoid cartilage.
3. base of arytenoid cartilage (articulates with the posterior part of the cricoid cartilage).
4. vocal process of arytenoid cartilage (gives attachment to the vocal cord).

Fig.(629): CORNICULATE CARTILAGES

These are 2 small nodules each of which articulates with the apex of the arytenoid cartilage.



1. corniculate cartilage.
2. arytenoid cartilage.
3. cricoid cartilage.



Fig.(630): SHAPE OF EPIGLOTTIS

It is a leaf-like plate of elastic fibrocartilage which has a long narrow stalk and a broad rounded upper end.

1. broad upper end.
2. posterior surface perforated by mucous glands.
3. narrow stalk.
4. tubercle of epiglottis (elevated median area).

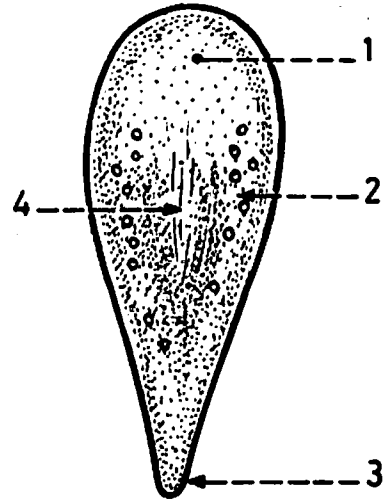


Fig.(631): POSITION OF EPIGLOTTIS

It lies in front of the entrance of the larynx behind the root of the tongue, body of hyoid bone and upper part of the thyroid cartilage (from above downwards).

1. vallecula (a depression between the epiglottis and root of the tongue).
2. epiglottis (side view).
3. thyroepiglottic ligament.
4. thyroid cartilage.
5. thyrohyoid membrane.
6. hyoid bone.

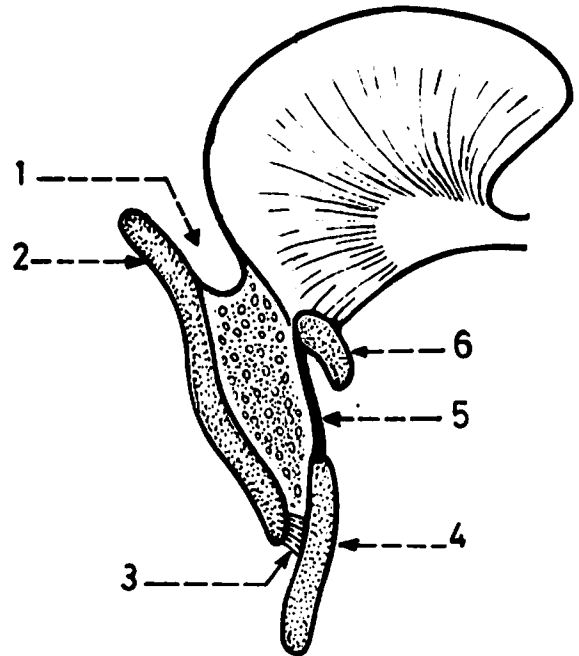


Fig.(632): GLOSSO-EPIGLOTTIC FOLDS

The upper part of the anterior surface of the epiglottis is attached to the pharyngeal part of the tongue by a median and 2 lateral glosso-epiglottic folds.

1. left lateral glosso-epiglottic fold.
2. pharyngeal part of the tongue.
3. median glosso-epiglottic fold.
4. right lateral glosso-epiglottic fold.
5. epiglottis.

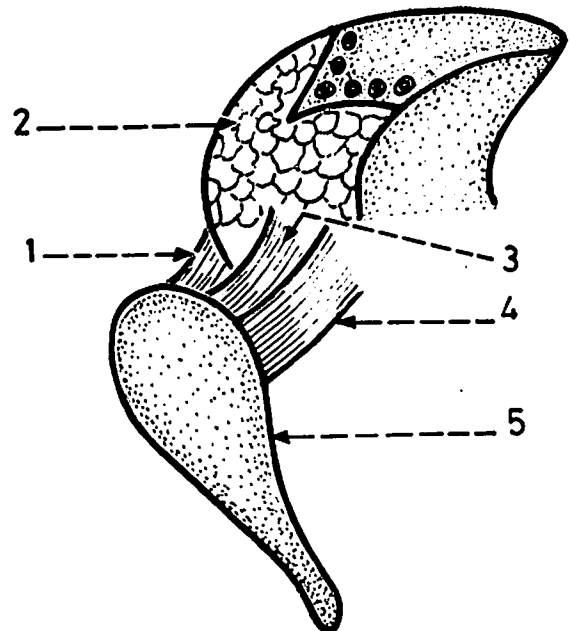


Fig.(633): EPIGLOTTIS AS SEEN FROM BEHIND

The long narrow stalk of epiglottis lies in the median plane behind the upper part of thyroid cartilage.

1. posterior surface of epiglottis.
2. upper broad end of the epiglottis.
3. tubercle of the epiglottis.
4. stalk of the epiglottis.
5. attachment of vestibular folds.
6. attachment of vocal folds.
7. posterior part of cricoid cartilage.

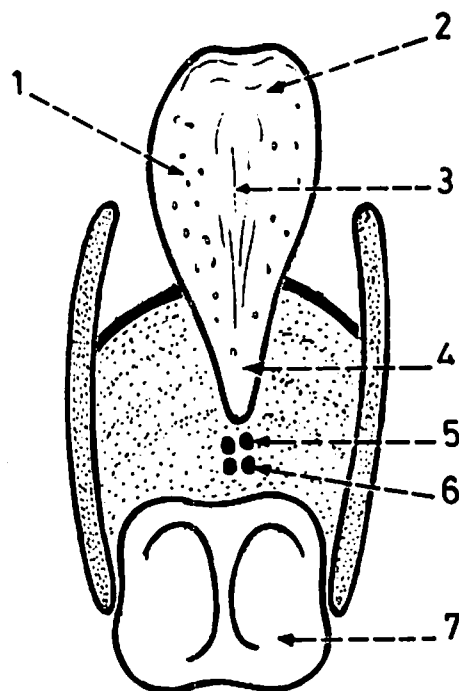


Fig.(634): HYO-EPIGLOTTIC AND THYRO-EPIGLOTTIC LIGAMENTS

The hyo-epiglottic ligament connects the epiglottis to the upper border of hyoid bone, while the thyro-epiglottic ligament connects the epiglottis to the upper part of thyroid cartilage.

1. epiglottis.
2. hyo-epiglottic ligament.
3. body of hyoid bone.
4. thyro-epiglottic ligament.
5. thyroid cartilage.

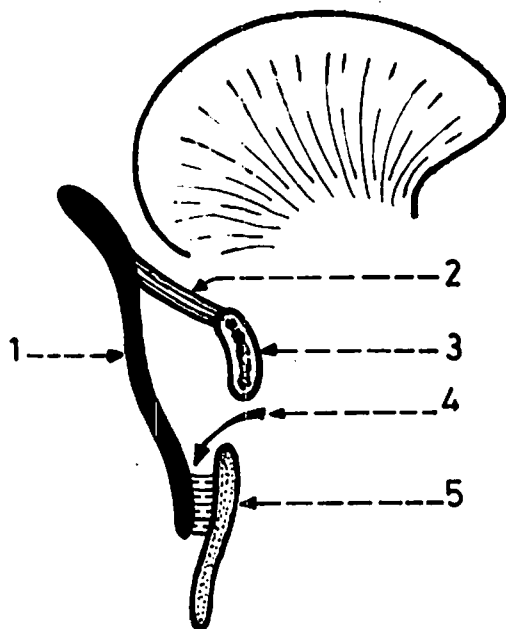
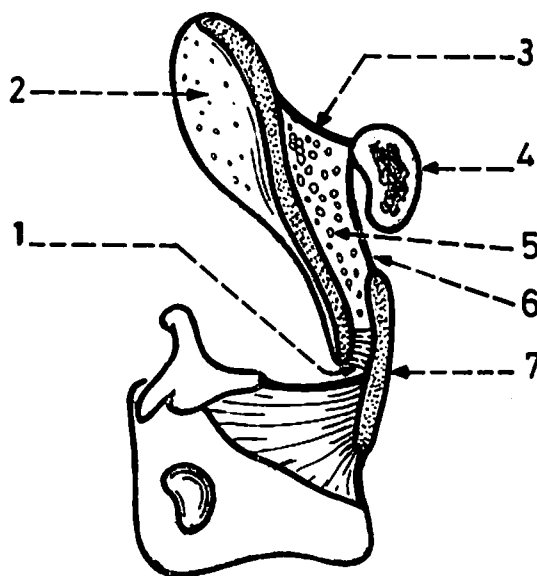


Fig.(635): RELATION OF THE EPIGLOTTIS TO THE THYROHYOID MEMBRANE

The anterior surface of the epiglottis is separated from the thyrohyoid membrane by fatty areolar tissue.

1. thyro-epiglottic ligament.
2. epiglottis.
3. hyo-epiglottic ligament.
4. body of hyoid bone.
5. fatty tissue deep to the thyrohyoid membrane.
6. thyrohyoid membrane.
7. thyroid cartilage.

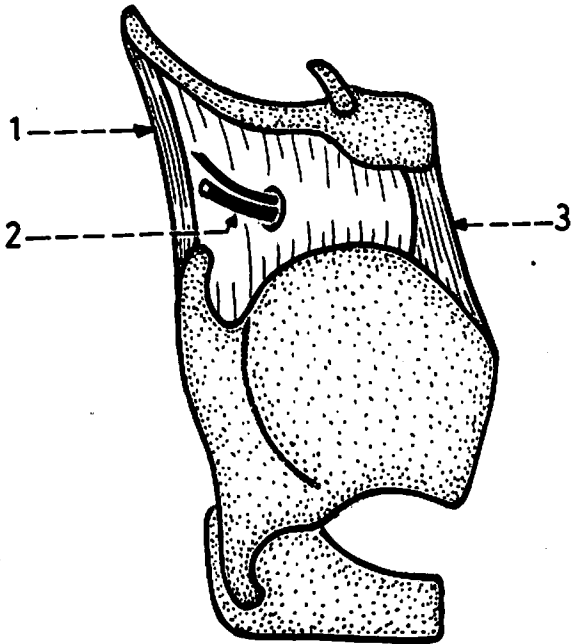
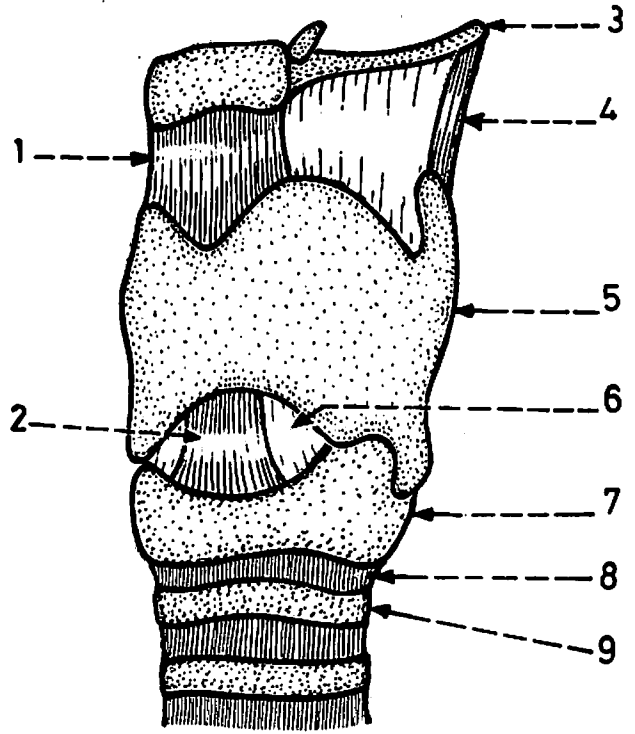


# LIGAMENTS AND MEMBRANES OF THE LARYNX

**Fig.(636): THYROHYOID MEMBRANE AND CRICOTHYROID LIGAMENT**

The thyrohyoid membrane extends from the thyroid cartilage to the hyoid bone, while the cricothyroid ligament extends between the cricoid and thyroid cartilages.

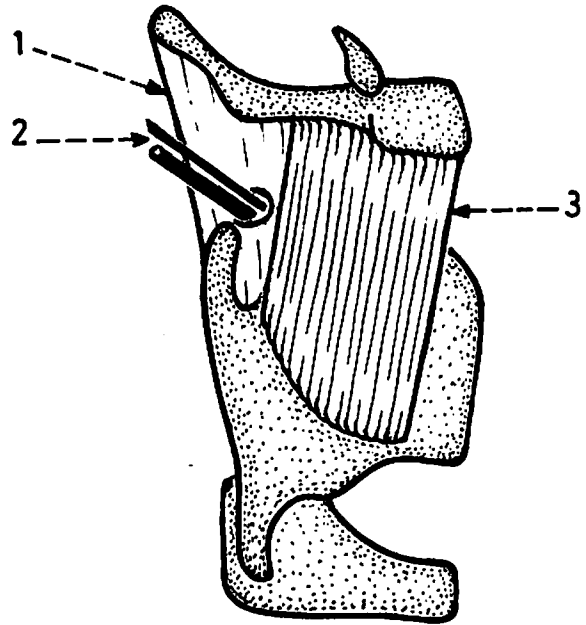
1. thyrohyoid membrane.
2. median part of cricothyroid ligament.
3. hyoid bone.
4. thickened lateral border of thyrohyoid membrane.
5. thyroid cartilage.
6. lateral part of cricothyroid ligament.
7. cricoid cartilage.
8. cricotracheal ligament.
9. 1st tracheal ring.



**Fig.(637): PARTS OF THYROHYOID MEMBRANE**

Its middle part is thickened and termed median thyrohyoid ligament, and its lateral border is cord-like and termed lateral thyrohyoid ligament.

1. lateral thyrohyoid ligament.
2. internal laryngeal nerve and superior laryngeal artery.
3. median thyrohyoid ligament.



**Fig.(638): RELATIONS OF THYROHYOID MEMBRANE**

It is covered by thyrohyoid muscle and pierced by the internal laryngeal nerve and superior laryngeal artery.

1. thyrohyoid membrane.
2. internal laryngeal nerve and superior laryngeal artery.
3. thyrohyoid muscle.

Fig.(639): ATTACHMENT OF THYROHYOID MEMBRANE

It is attached below to the upper border of thyroid cartilage and above to the upper edge of the posterior surface of the hyoid bone and its greater horns.

1. thyrohyoid membrane.
2. hyoid bone.
3. bursa between the body of hyoid bone and the membrane.
4. thyroid cartilage.

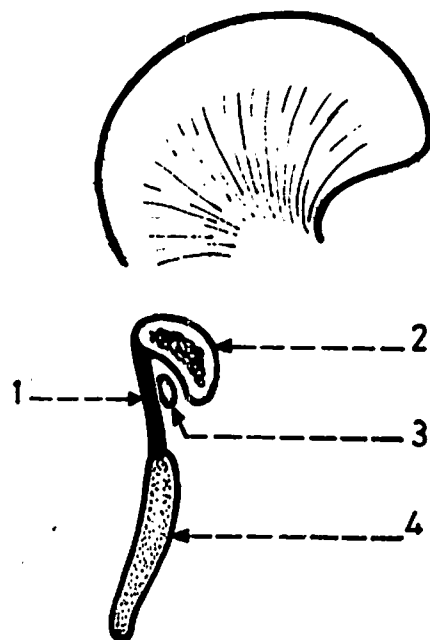


Fig.(640): INTRINSIC LIGAMENTS OF THE LARYNX (sagittal section)

These are the quadrangular ligament above and the cricothyroid ligament below. Both ligaments lie beneath the mucous membrane of the larynx.

1. epiglottis.
2. ary-epiglottic fold.
3. cuneiform cartilage.
4. corniculate cartilage.
5. quadrangular ligament.
6. vestibular ligament (is the free lower border of the quadrangular ligament).
7. vocal ligament (is the free upper border of the cricothyroid ligament).
8. cricothyroid ligament.

\* The ary-epiglottic fold represents the upper free border of the quadrangular ligament.

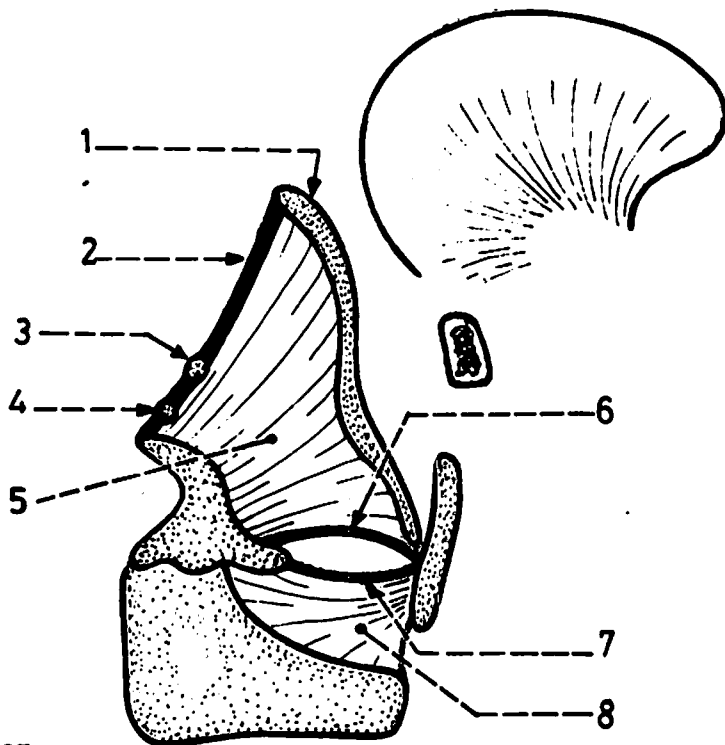


Fig.(641): LIGAMENTS ATTACHED TO THE MIDLINE OF THE INNER SURFACE OF THYROID CARTILAGE

1. thyroepiglottic ligament.
2. vestibular ligaments (one on each side).
3. vocal ligaments (one on each side).

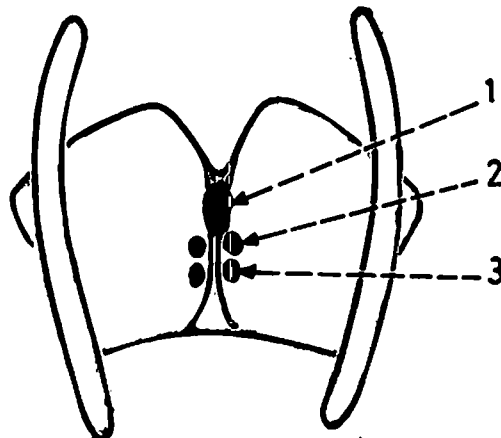


Fig.(642): QUADRANGULAR LIGAMENT

It lies beneath the mucous membrane of the upper part of the larynx extending from the inlet of the larynx to the vestibular folds. It is attached behind to the arytenoid cartilage and in front to the side of the epiglottis. It has a free upper border (ary-epiglottic fold) and a free lower border (vestibular fold).

1. epiglottis.
2. inlet of the larynx.
3. quadrangular ligament.
4. vestibular fold (ligament).
5. arytenoid cartilage.
6. ary-epiglottic fold.

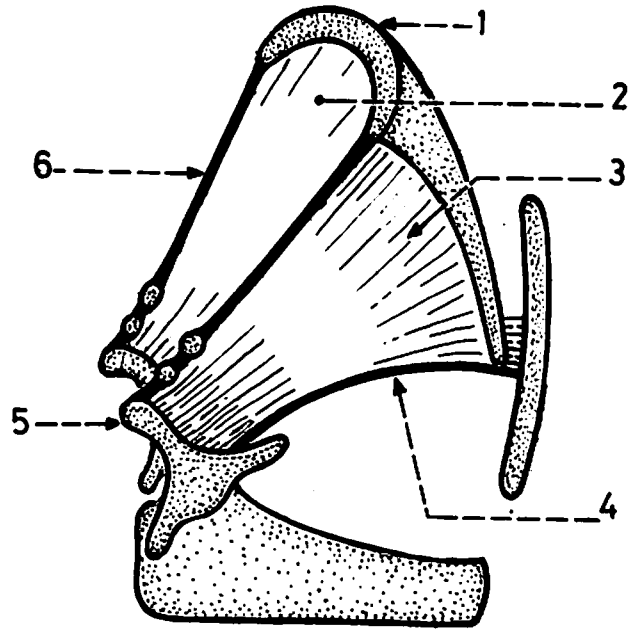


Fig.(643): CRICOTHYROID LIGAMENT

The lateral part of the cricothyroid ligament is thin and has a free thickened upper edge termed the vocal ligament. This vocal ligament extends from the vocal process of arytenoid cartilage behind to the deep surface of the angle of thyroid cartilage in front.

1. arytenoid cartilage.
2. cricoid cartilage.
3. vocal ligaments (folds).
4. lateral part of cricothyroid ligament (also called crico-vocal ligament).
5. anterior thick part of cricothyroid ligament.

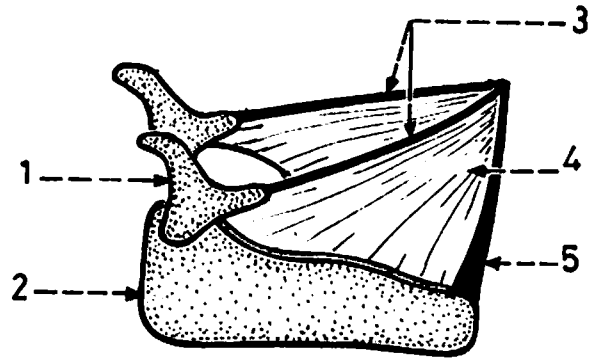


Fig.(644): QUADRANGULAR AND CRICOTHYROID LIGAMENTS

1. inlet of the larynx.
2. ary-epiglottic fold.
3. epiglottis.
4. quadrangular ligament.
5. vocal fold.
6. interval between the 2 vocal folds (rima glottidis).
7. lateral part of cricothyroid ligament.

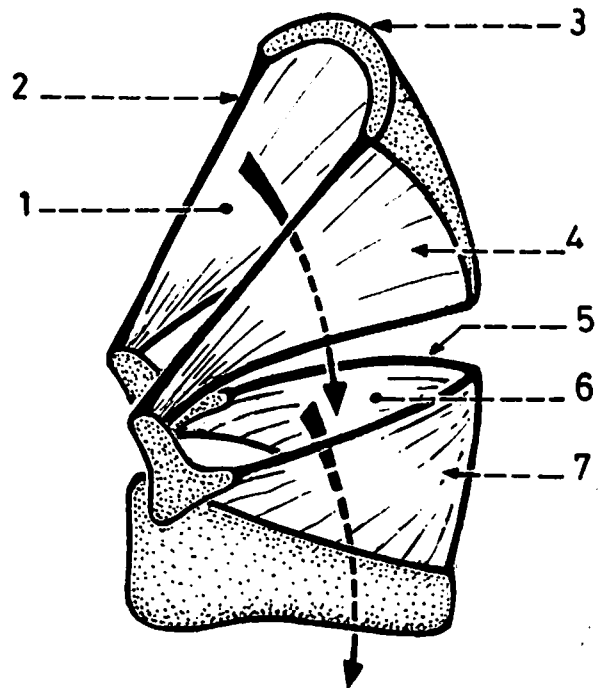


Fig.(645): LIGAMENTS OF THE LARYNX  
IN CORONAL SECTION

1. sinus of the larynx.
2. epiglottis.
3. tubercle of the epiglottis.
4. ary-epiglottic fold.
5. greater horn of hyoid bone.
6. thyrohyoid membrane.
7. quadrangular ligament (its lower border forms the vestibular ligament).
8. thyroid cartilage.
9. cricothyroid ligament (its upper border forms the vocal ligament).
10. cricoid cartilage.

\* The sinus of the larynx leads to a pouch on each side called saccule of the larynx.

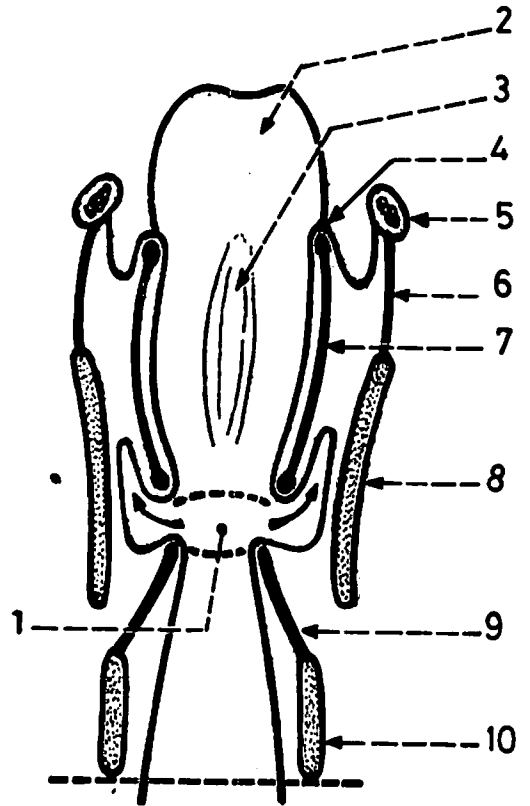


Fig.(646): CAVITY OF THE LARYNX  
IN CORONAL SECTION

It extends from the upper edge of the epiglottis and the ary-epiglottic fold above (inlet of the larynx) to the lower border of the cricoid cartilage below.

It is divided into 3 parts by the vestibular and vocal folds.

1. vestibule of the larynx (from the inlet of the larynx to the vestibular folds).
2. saccule of the larynx.
3. middle part of the cavity (between the vestibular folds above and the vocal folds below).
4. lower part of the cavity (from the vocal cords to the lower border of the cricoid cartilage).

\* Note that the interval between the 2 vestibular folds is called rima vestibuli, while the interval between the 2 vocal folds is called rima glottidis.

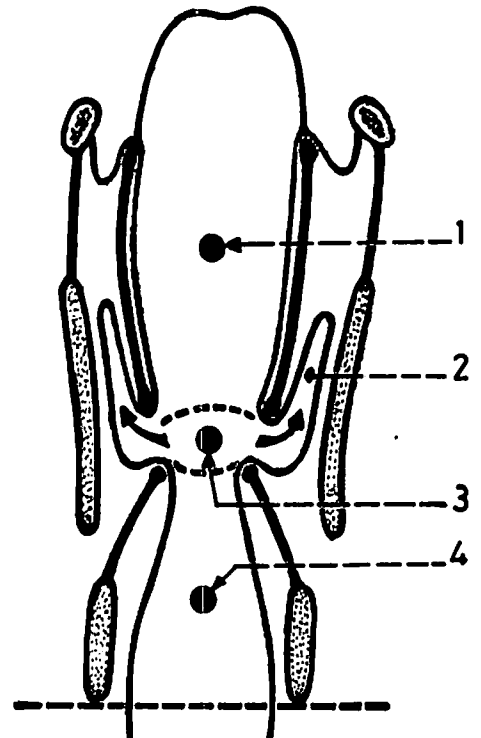
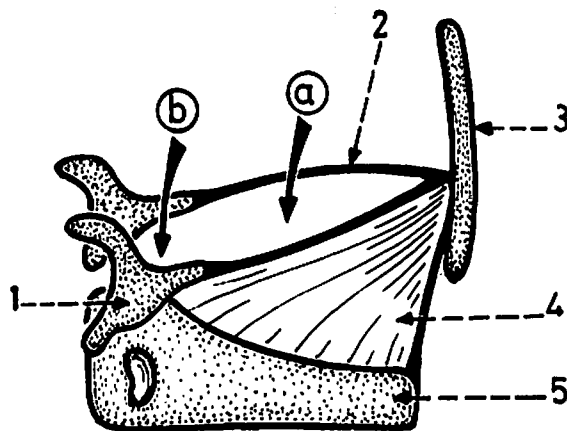


Fig.(647):RIMA GLOTTIDIS

It is the interval between the 2 vocal folds anteriorly and between the 2 arytenoid cartilages posteriorly. It is the narrowest part of the cavity of the larynx.



(a) intermembranous part of the rima glottidis: between the 2 vocal folds.

(b) intercartilagenous part of rima glottidis: between the 2 arytenoid cartilages.

1. arytenoid cartilage.
2. vocal fold.
3. thyroid cartilage.
4. cricothyroid ligament.
5. cricoid cartilage.

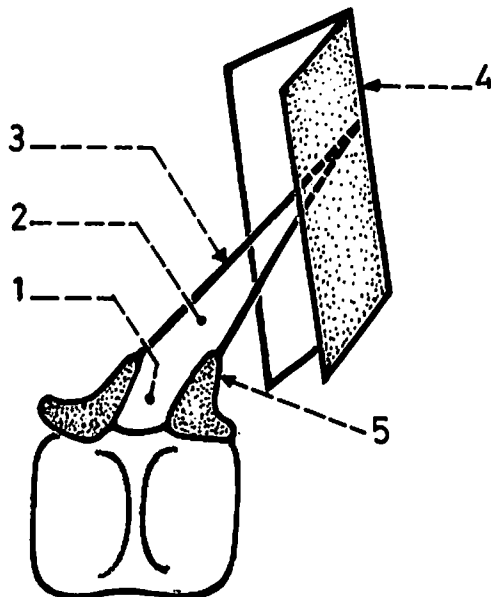


Fig.(648): VOCAL FOLDS

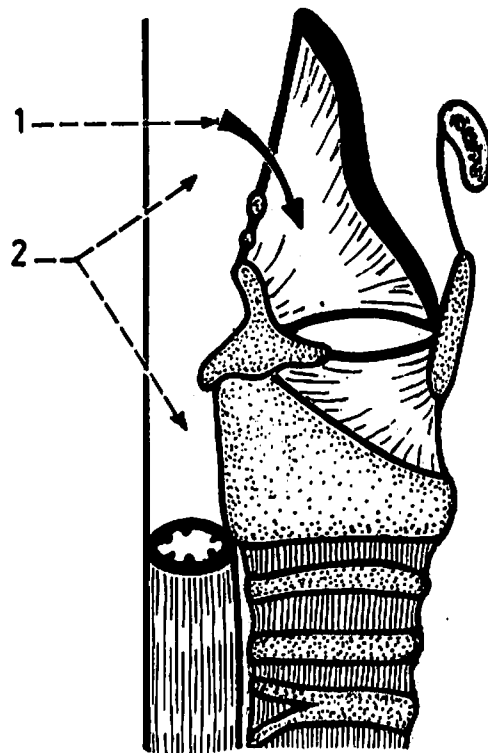
These are folds of mucous membrane covering the 2 vocal ligaments (vocal cords). Each vocal fold stretches from the vocal process of the arytenoid cartilage posteriorly to the middle of the angle of the thyroid cartilage anteriorly. It is the upper free border of the cricothyroid ligament. (see figure 647).

1. intercartilagenous part of rima glottidis.
2. intermembranous part of rima glottidis.
3. vocal fold.
4. angle of thyroid cartilage.
5. vocal process of arytenoid cartilage.

Fig.(649): INLET OF THE LARYNX

It is directed backwards and opens into the laryngopharynx. It is bounded by the upper edge of the epiglottis, the 2 ary-epiglottic folds and the 2 arytenoid cartilages.

1. inlet of the larynx.
2. laryngo-pharynx (behind the larynx).



# INTRINSIC MUSCLES OF THE LARYNX

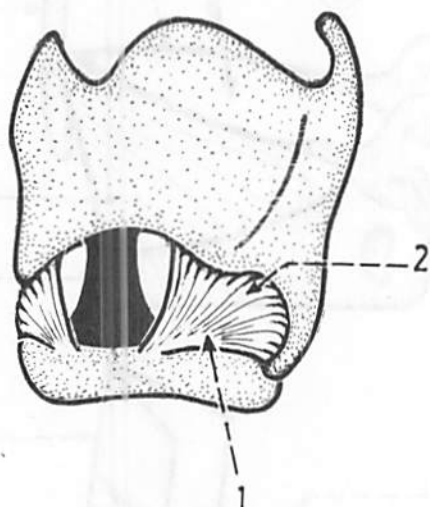


Fig.(650): ATTACHMENTS OF CRICOTHYROID

It overlies the lateral part of the cricothyroid membrane.

1. origin from the outer surface of the lateral part of the cricoid cartilage.
2. insertion into the lower border of the thyroid cartilage and anterior border of its inferior horn.

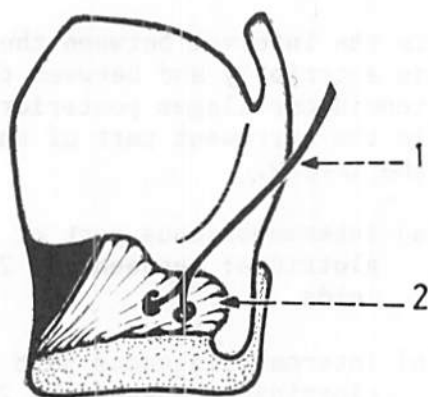


Fig.(651): NERVE SUPPLY OF CRICOTHYROID

It is supplied by the external laryngeal nerve.

1. external laryngeal nerve.
2. cricothyroid muscle.

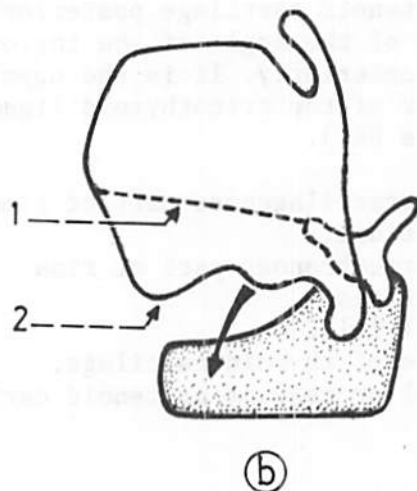
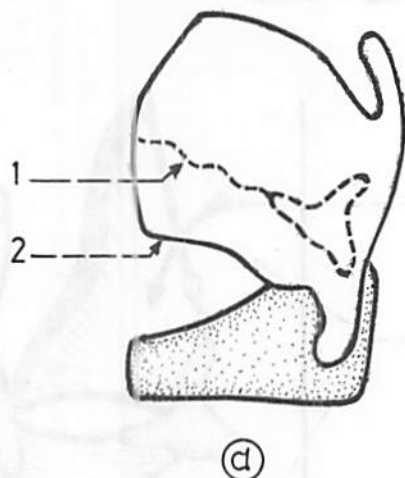


Fig.(652): ACTION OF CRICOTHYROID

(a) relaxed vocal ligaments.

(b) stretched vocal ligaments by contraction of cricothyroid: contraction of the muscle pulls on the thyroid cartilage forwards, thus rendering the vocal ligaments tense.

1. vocal ligament.

2. thyroid cartilage.



Fig.(653): LATERAL CRICO-ARYTENOID MUSCLE

1. origin from the upper border of the cricoid cartilage.
2. insertion into the front of the muscular process of the arytenoid cartilage.

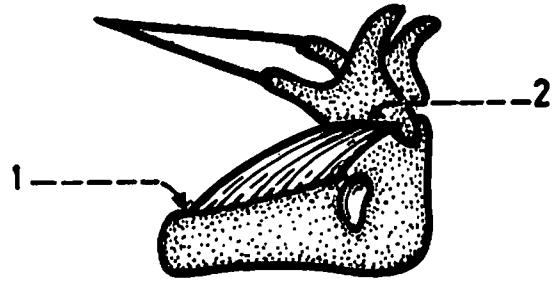


Fig.(654): POSITION OF THE LATERAL CRICO-ARYTENOID MUSCLE

It lies under cover of the cricothyroid muscle as well as the lower part of the thyroid cartilage.

1. lateral crico-arytenoid muscle.
2. origin of cricothyroid muscle.

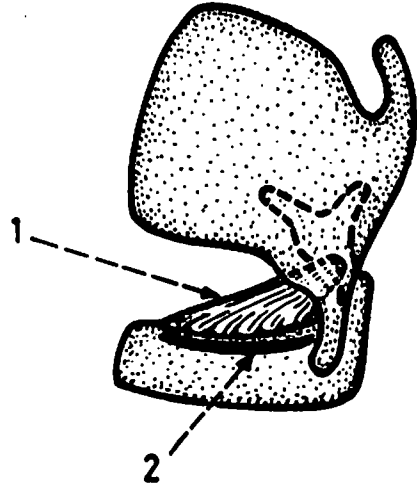


Fig.(655): POSTERIOR CRICO-ARYTENOID MUSCLE

It lies on the back of the cricoid cartilage.

1. origin from the back of the lamina of the cricoid cartilage.
2. insertion into the muscular process of the arytenoid cartilage.

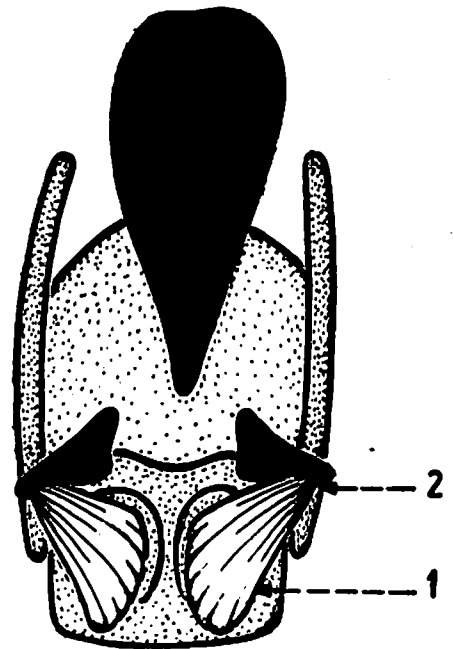


Fig.(656): LATERAL AND POSTERIOR CRICO-ARYTENOID MUSCLES

The lateral crico-arytenoid pulls on the muscular process forwards, thus rotating the arytenoid cartilage medially and the vocal ligament becomes adducted.  
The posterior crico-arytenoid pulls on the muscular process backwards, thus rotating the arytenoid cartilage laterally and the vocal ligament becomes abducted.

1. lateral crico-arytenoid muscle.
2. vocal process of arytenoid cartilage.
3. posterior crico-arytenoid muscle.
4. muscular process of arytenoid cartilage.

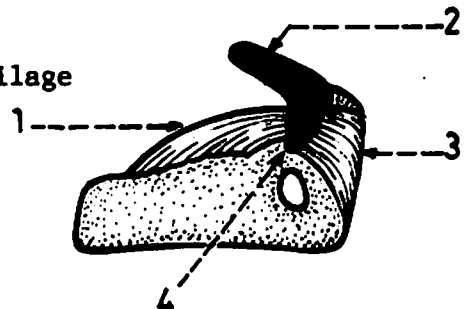


Fig.(657): TRANSVERSE ARYTENOID MUSCLE

It is a median muscle which extends transversely between the bodies and muscular processes of the 2 arytenoid cartilages.

1. transverse arytenoid muscle.
2. muscular process of arytenoid cartilage.

\* Contraction of this muscle draws the arytenoid cartilages towards the midline leading to adduction of the vocal ligaments.

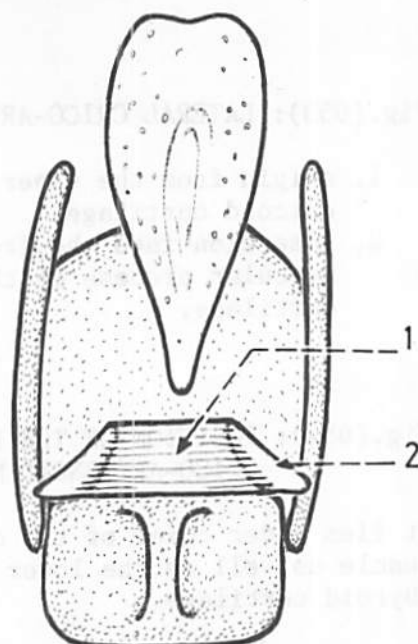


Fig.(658): OBLIQUE ARYTENOID MUSCLES

The muscles of the 2 sides cross each other superficial to the transverse arytenoid.

1. arytenoid cartilage.
2. origin of oblique arytenoid muscle from the muscular process.
3. transverse arytenoid muscle.
4. insertion of oblique arytenoid muscle into the apex of the opposite arytenoid cartilage.
5. corniculate cartilage.

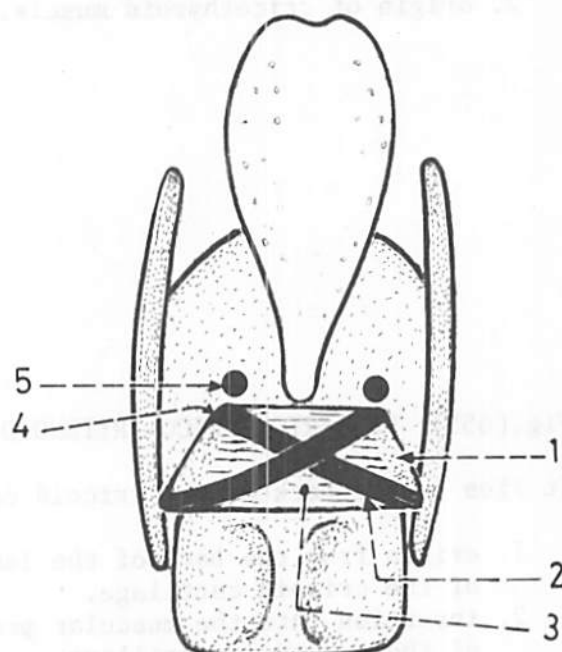


Fig.(659): ARY-EPIGLOTTIC MUSCLE

It is an extension forwards and upwards of the oblique arytenoid into the ary-epiglottic fold (one on each side). Contraction of these muscles closes the inlet of the larynx.

1. transverse arytenoid muscle.
2. ary-epiglottic muscle.
3. apex of arytenoid cartilage (where the oblique arytenoid ends and the ary-epiglottic muscle begins).
4. oblique arytenoid muscle.

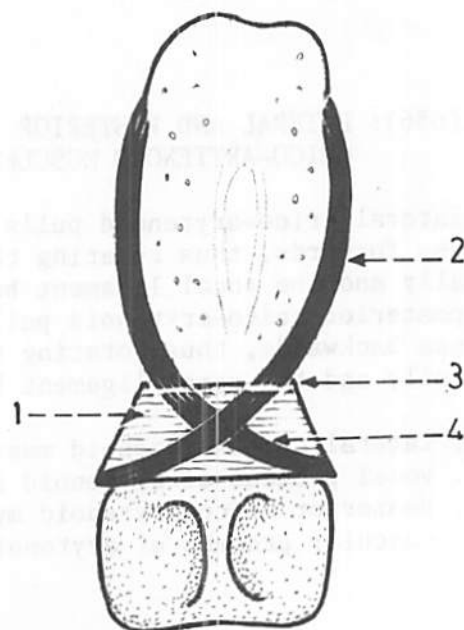


Fig.(660): ACTION OF OBLIQUE ARYTENOID  
AND ARY-EPIGLOTTIC MUSCLES

These muscles act as a sphincter for the inlet of the larynx by approximating the 2 ary-epiglottic folds together, and by drawing the 2 arytenoid cartilages towards the epiglottis.

1. epiglottis.
2. ary-epiglottic muscle.
3. oblique arytenoid muscle.

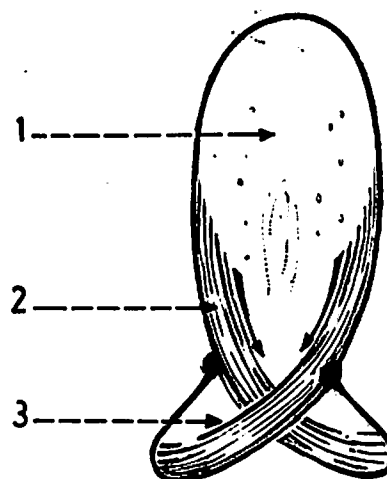


Fig.(661): THYRO-ARYTENOID MUSCLE

It extends from the lower 1/2 of the angle of the thyroid cartilage (in front) to the front of the arytenoid cartilage (behind). It lies lateral to the vocal ligament and its most medial fibres are attached to the vocal ligament and form the vocalis muscle.

1. vocal ligaments.
2. thyroid cartilage (horizontal section).
3. thyro-arytenoid muscle.
4. vocalis muscle.

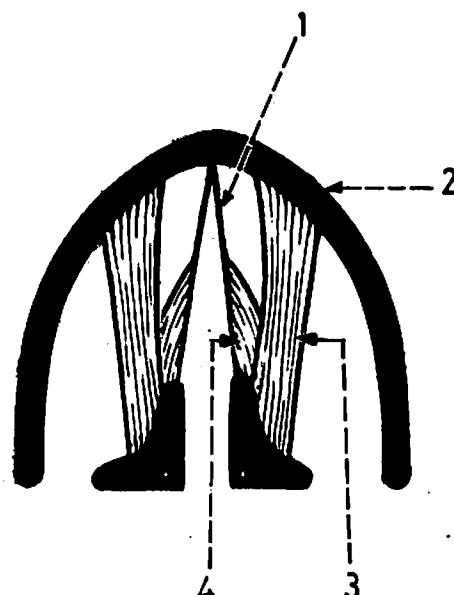
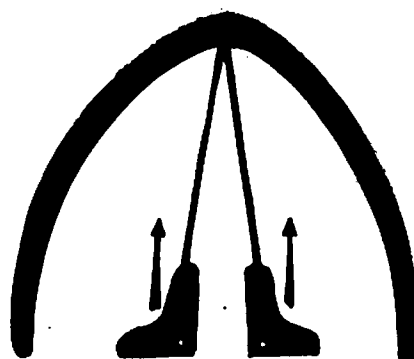


Fig.(662): ACTION OF THYRO-ARYTENOID MUSCLE

Contraction of this muscle draws the arytenoid cartilage forwards and thus the vocal ligament becomes lax.



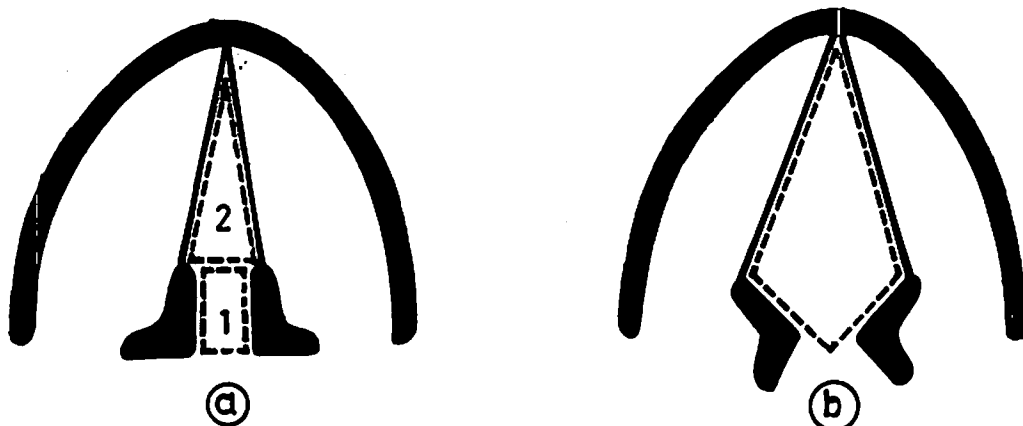
MOVEMENTS OF VOCAL LIGAMENTS

Fig.(663): SHAPE OF RIMA GLOTTIDIS

(a) in condition of rest (quiet respiration):

1. the intercartilagenous part of the rima glottidis is rectangular in shape.
2. the intermembranous part of the rima glottidis is triangular in shape.

(b) in forced inspiration:

the arytenoid cartilages rotate laterally leading to extreme abduction of the vocal ligaments (cords). Thus, the rima glottidis (glottis) becomes lozenge in shape.

Fig.(664): LATERAL ROTATION OF  
ARYTENOID CARTILAGES

This movement leads to abduction of the vocal cords. It is produced by the posterior crico-arytenoid muscle.

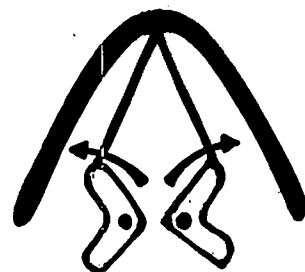


Fig.(665): ADDUCTION OF ARYTENOID CARTILAGES

This is produced mainly by the transverse arytenoid muscle leading to adduction of the vocal cords.

Adduction of the vocal cords is also produced by medial rotation of the arytenoid cartilages by the lateral crico-arytenoid muscle.

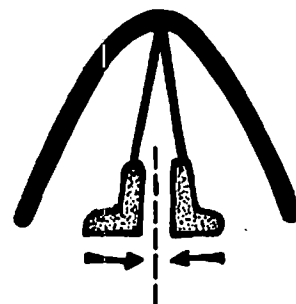


Fig.(666): PARALYSIS OF RIGHT  
RECURRENT LARYNGEAL NERVE

The right vocal cord is adducted close to the median plane. In this condition neither phonation nor inspiration is seriously affected.

Adduction of the right vocal cord is produced by the cricothyroid muscle which is supplied by the external laryngeal nerve.

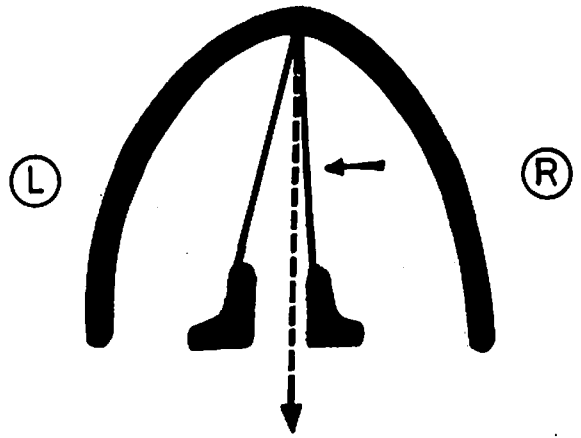


Fig.(667): PARALYSIS OF RECURRENT  
LARYNGEAL NERVES OF BOTH SIDES

Both vocal cords are adducted towards the midline by the cricothyroid muscles. In this condition there is respiratory distress and even suffocation. There is hoarse voice, but no complete loss of phonation.

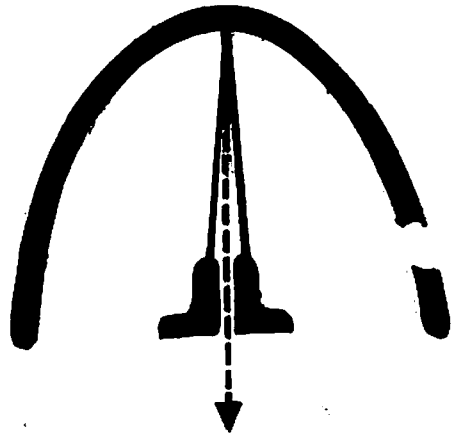


Fig.(668): PARALYSIS OF RECURRENT AND  
EXTERNAL LARYNGEAL NERVES  
ON THE RIGHT SIDE

The right vocal cord is completely motionless (lies in the cadaveric position). The left cord crosses the median plane for compensation. In this condition neither phonation nor inspiration is seriously affected.

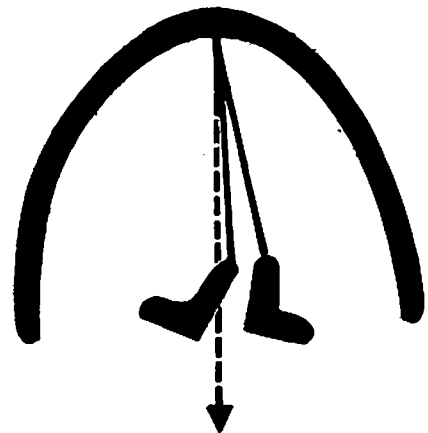


Fig.(669): PARALYSIS OF RECURRENT AND  
EXTERNAL LARYNGEAL NERVES  
ON BOTH SIDES

The 2 vocal cords lie in the cadaveric position (midway between adduction and abduction). In this condition phonation is completely lost but inspiration is not affected.

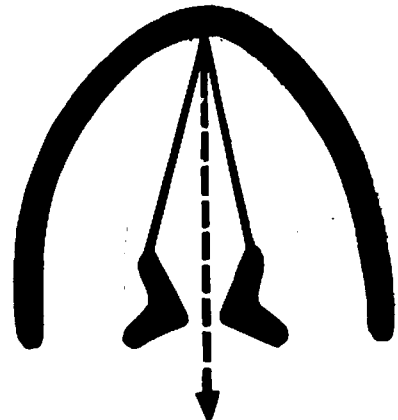
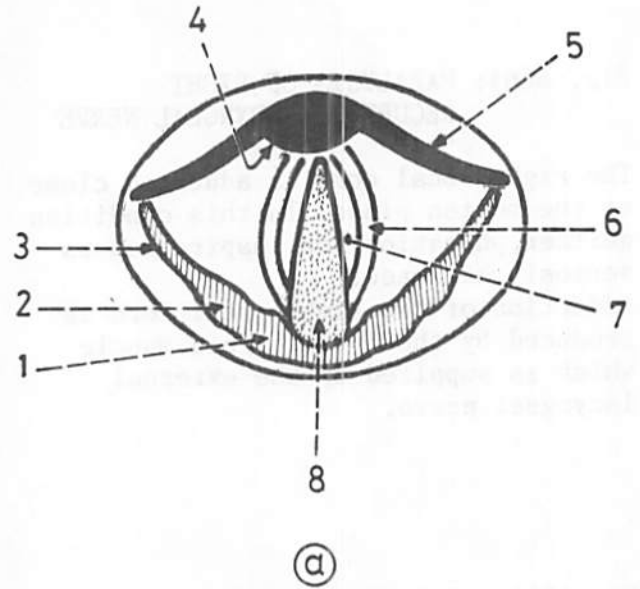


Fig.(670): STRUCTURES SEEN INSIDE THE LARYNX BY THE LARYNGOSCOPE

(a) In quiet respiration:

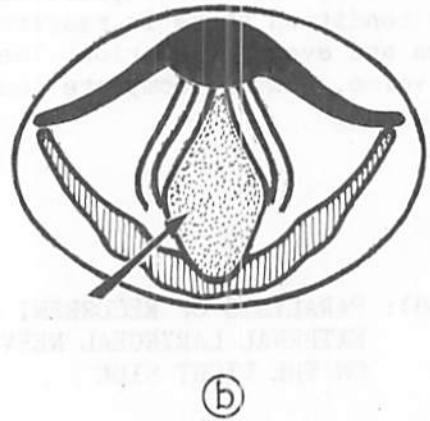
The rima glottidis is triangular anteriorly and rectangular posteriorly.

1. corniculate cartilage.
2. cuneiform cartilage.
3. ary-epiglottic fold.
4. tubercle of epiglottis.
5. epiglottis.
6. vestibular fold.
7. vocal fold.
8. rima glottidis (glottis).



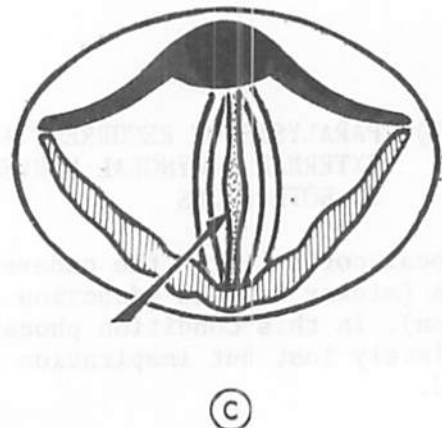
(b) In forced respiration:

The vocal cords are fully abducted and the rima glottidis becomes lozenge in shape (rhomboid).



(c) During phonation:

The vocal cords move towards the midline leading to narrowing of the rima glottidis.



# NERVE SUPPLY OF THE LARYNX

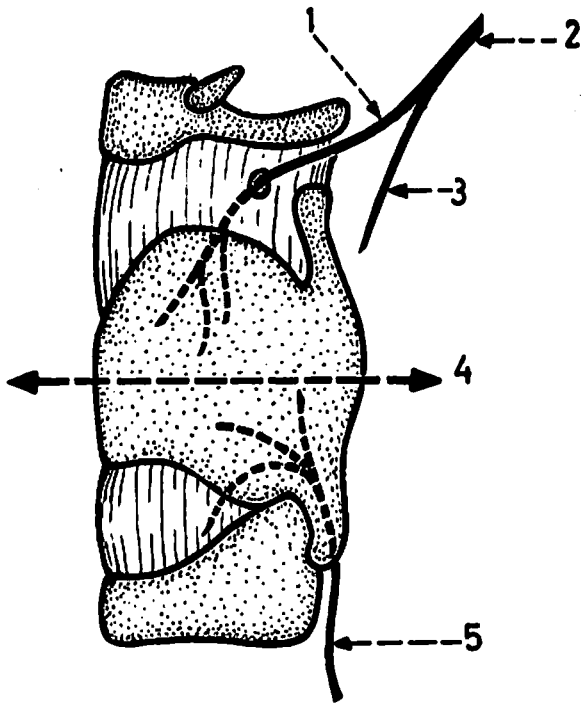


Fig.(671): NERVES OF THE LARYNX  
(from outside)

These are the superior laryngeal and recurrent laryngeal nerves.

1. internal laryngeal nerve (pierces the thyrohyoid membrane and is sensory to the mucous membrane above the vocal cords).
2. superior laryngeal nerve.
3. external laryngeal nerve (motor to the cricothyroid muscle).
4. level of the vocal cords.
5. recurrent laryngeal nerve (enters the larynx behind the inferior horn of thyroid cartilage; supplies all muscles of the larynx except the cricothyroid and is sensory to the mucous membrane below the vocal cords).

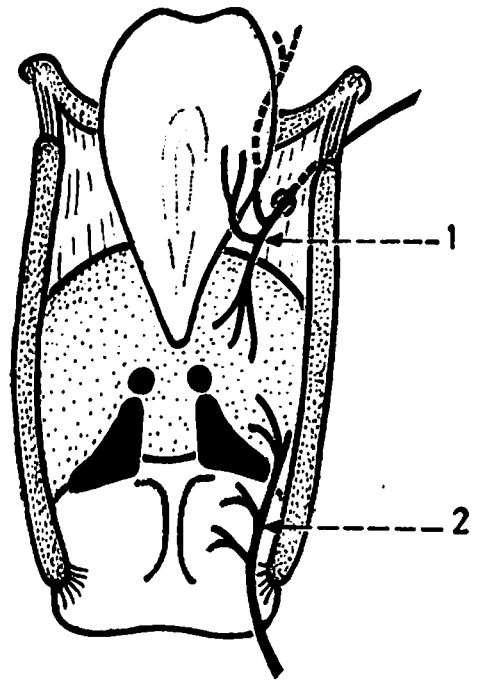
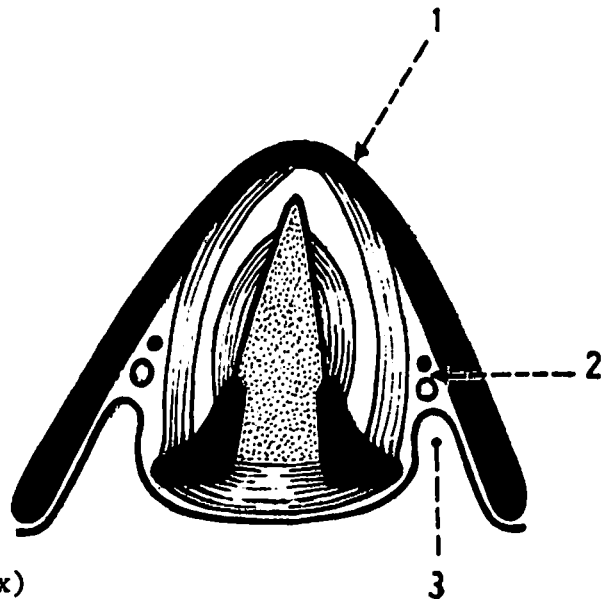


Fig.(672): NERVES OF THE LARYNX  
(from inside)

1. internal laryngeal nerve (in the piriform fossa lateral to the ary-epiglottic fold).
2. recurrent laryngeal nerve.

Fig.(673): INTERNAL LARYNGEAL NERVE AND SUPERIOR LARYNGEAL ARTERY IN THE PIRIFORM FOSSA  
(horizontal section in the larynx)



1. thyroid cartilage.
2. internal laryngeal nerve and superior laryngeal artery.
3. piriform fossa.

BLOOD SUPPLY AND LYMPH DRAINAGE OF THE LARYNX

Fig.(674): ARTERIES OF THE LARYNX

These are the superior and inferior laryngeal arteries.

1. superior laryngeal artery (a branch from the superior thyroid artery which pierces the thyrohyoid membrane in company with the internal laryngeal nerve).
2. level of vocal cords.
3. inferior laryngeal artery (a branch from the inferior thyroid artery and enters the larynx in company with the recurrent laryngeal nerve).

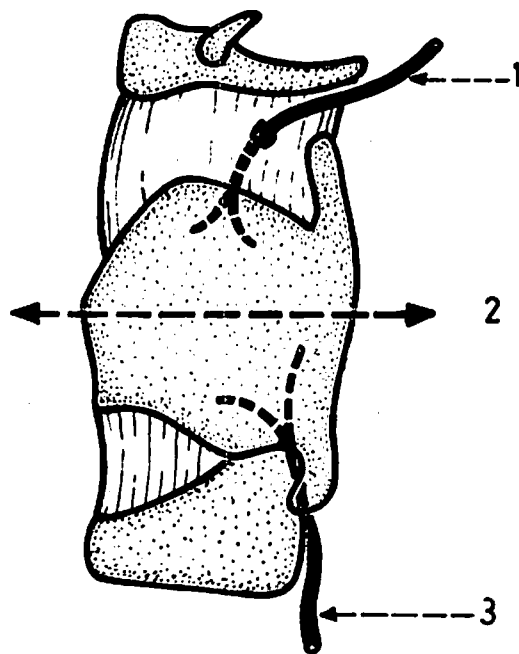
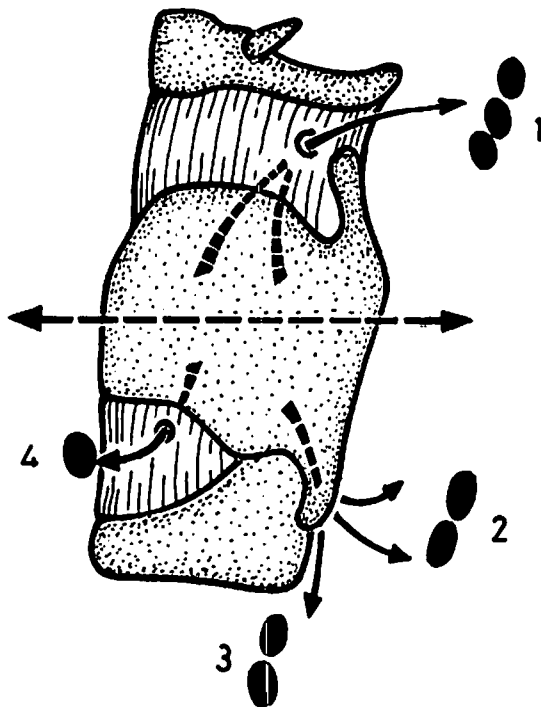


Fig.(675): LYMPH DRAINAGE OF THE LARYNX

The larynx is drained by 2 sets of lymph vessels: upper set above the vocal cords, and lower set below the vocal cords. All these vessels end in the deep cervical nodes, a node in front of the cricothyroid ligament and paratracheal nodes.

1. deep cervical nodes.
2. deep cervical nodes.
3. paratracheal nodes along the inferior thyroid artery.
4. prelaryngeal node in front of the cricothyroid ligament.





# NOSE

Fig.(676): ANTERIOR NASAL APERTURE

It is piriform in shape and is bounded by the 2 nasal bones (above) and by the 2 maxillae (below and on each side).

1. nasal bone.
2. anterior nasal aperture.
3. anterior nasal spine.

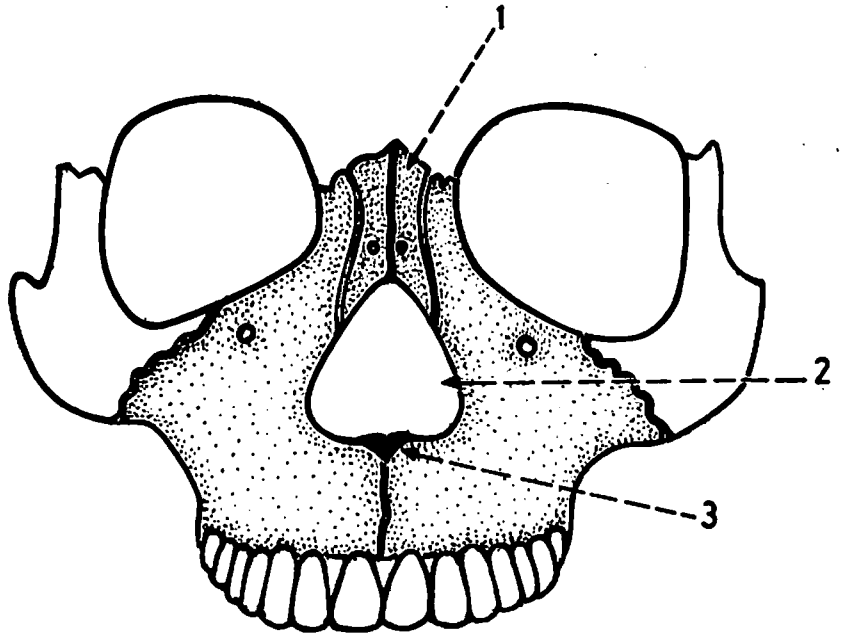


Fig.(677): POSTERIOR NASAL APERTURES (NASAL CHOANAE)

Each aperture is bounded medially by the vomer and laterally by the medial pterygoid plate.

1. posterior nasal spine.
2. vomer.
3. posterior nasal aperture.
4. medial pterygoid plate.

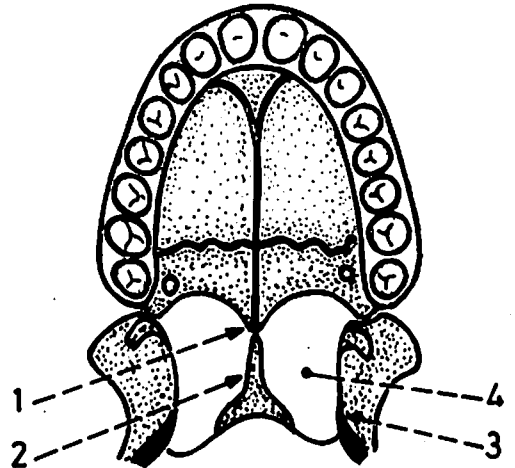


Fig.(678): SHAPE OF THE NASAL CAVITY

The cavity of the nose is divided by the nasal septum into right and left halves. Each half has a narrow upper part (near the roof) and a wider lower part (near the floor). The lateral wall is marked by 3 shelf-like projections called nasal conchae.

1. roof of the nose.
2. lateral wall of the nose.
3. nasal septum.
4. inferior nasal concha.
5. floor of the nose.

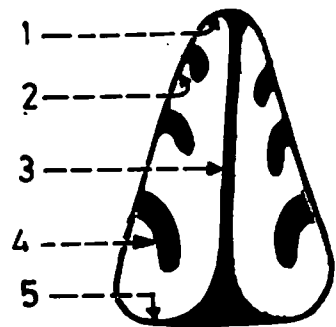


Fig.(679): ANATOMY OF THE EXTERNAL NOSE

The nose has a root and a free tip or apex. Its upper part is bony and formed by the nasal bones and frontal processes of the 2 maxillae, while its lower part is cartilagenous.

1. ala of the nose.
2. frontal process of maxilla.
3. root of the nose.
4. nasal bone.
5. nasal cartilages.
6. apex of the nose.

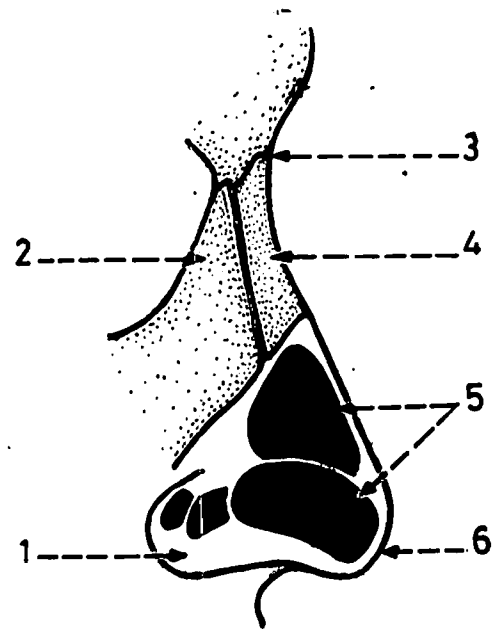


Fig.(680): NERVE SUPPLY OF THE SKIN OF THE NOSE

The skin of the nose is supplied by branches from the ophthalmic and maxillary nerves.

1. infratrochlear nerve (from nasociliary branch of ophthalmic).
2. infra-orbital nerve (from maxillary).
3. external nasal nerve (from nasociliary branch of ophthalmic).

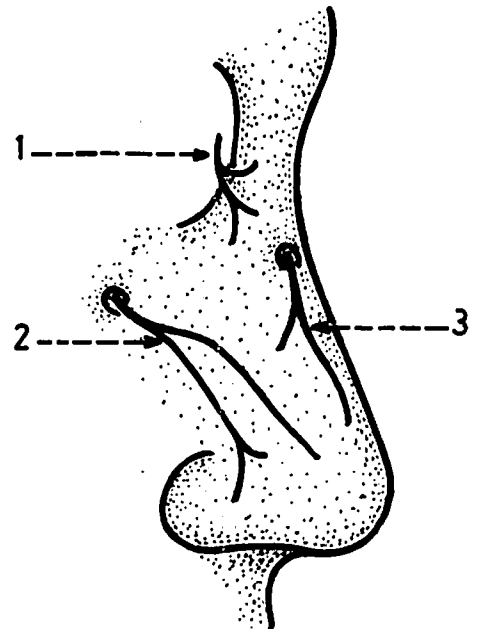


Fig.(681): ARTERIES OF THE SKIN OF THE NOSE

These are derived from the facial (from external carotid), maxillary (from external carotid) and ophthalmic (from internal carotid).

1. alar and septal branches of superior labial artery (from facial).
2. lateral nasal branch of facial artery.
3. infra-orbital artery.
4. dorsal nasal artery (from ophthalmic).

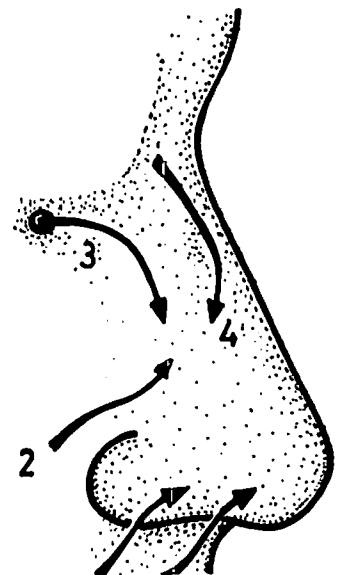


Fig.(682): ROOF AND FLOOR  
OF NASAL CAVITY

(a) Roof: its anterior part is sloping and is formed by the frontal and nasal bones, its middle part is horizontal and formed by the cribriform plate of ethmoid, while its posterior part is also sloping and formed by the body of sphenoid and ala of vomer.

(b) Floor: is formed by the bony palate and shows the incisive canals in its anterior part.

1. incisive canal.
2. anterior sloping part of the roof.
3. horizontal part of the roof (separates the nasal cavity from the anterior cranial fossa).
4. posterior sloping part of the roof.
5. palatine process of maxilla.
6. horizontal plate of palatine bone.

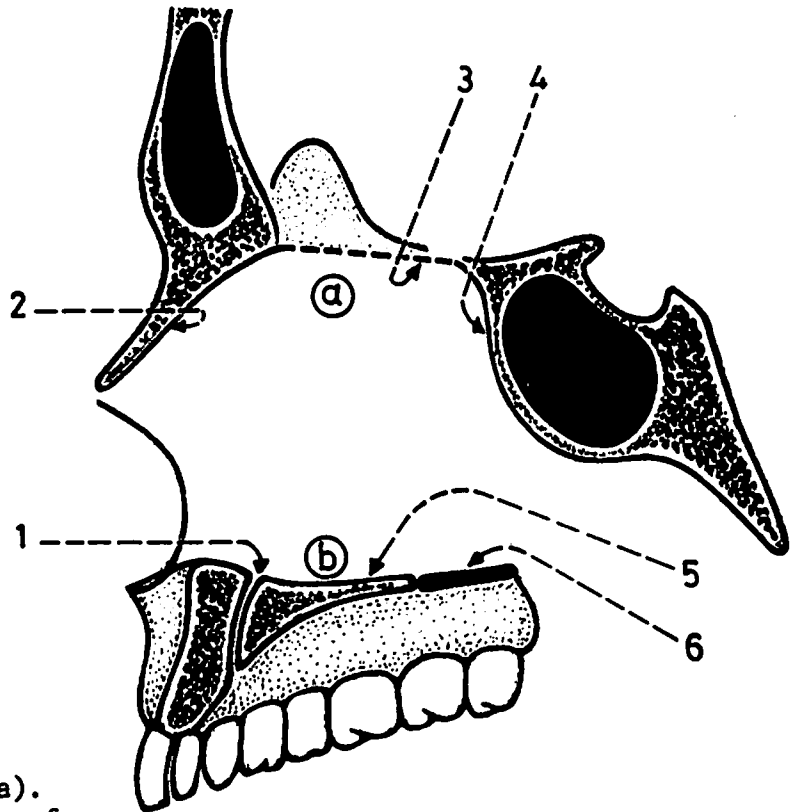
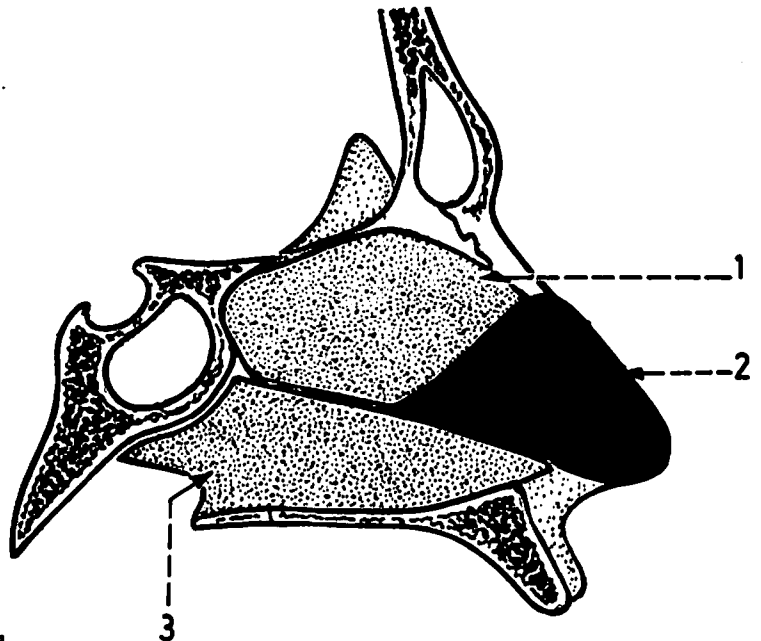


Fig.(683): NASAL SEPTUM

It forms the medial wall of each half of the nasal cavity and is formed by the vomer, perpendicular plate of ethmoid and septal cartilage.

1. perpendicular plate of ethmoid (forms the upper and anterior part).
2. septal cartilage (forms the anterior part).
3. vomer (forms the lower and posterior part).



\* The nasal septum may be deviated to one side at the suture between the vomer and perpendicular plate of the ethmoid.

Fig.(684): PARTS OF THE NASAL CAVITY

The nasal cavity is subdivided into vestibule, olfactory part and respiratory part.

- (a) olfactory part: is limited to the upper part of the nasal cavity opposite the superior nasal concha. Its mucous membrane contains olfactory cells which give rise to the fibres of the olfactory nerve.
- (b) respiratory part: comprises most of the nasal cavity and its mucous membrane is columnar ciliated with goblet cells.
- (c) vestibule: is the part just posterior to the nostril and is bounded laterally by the ala. It is lined with skin which contains hairs (vibrissae), sebaceous and sweat glands.

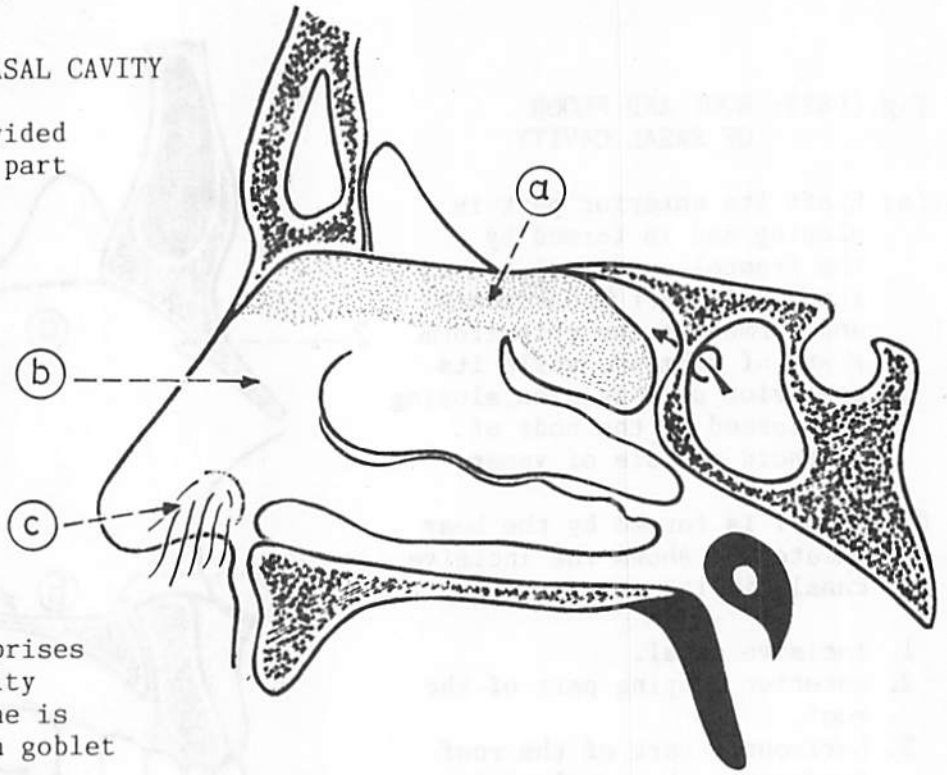
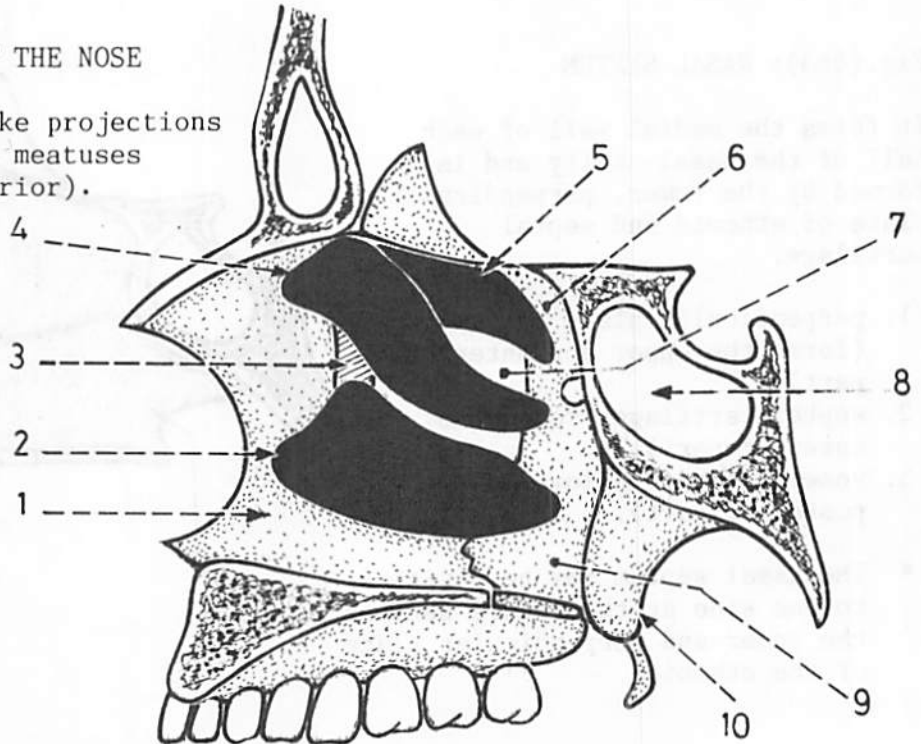


Fig.(685): LATERAL WALL OF THE NOSE

It is marked by 3 shelf-like projections called nasal conchae and 3 meatuses (superior, middle and inferior).

- 1. inferior nasal meatus.
- 2. inferior concha.
- 3. middle meatus.
- 4. middle concha.
- 5. superior concha.
- 6. spheno-ethmoidal recess (above the superior concha).
- 7. superior meatus.
- 8. sphenoidal air sinus.
- 9. perpendicular plate of palatine bone.
- 10. medial pterygoid plate.



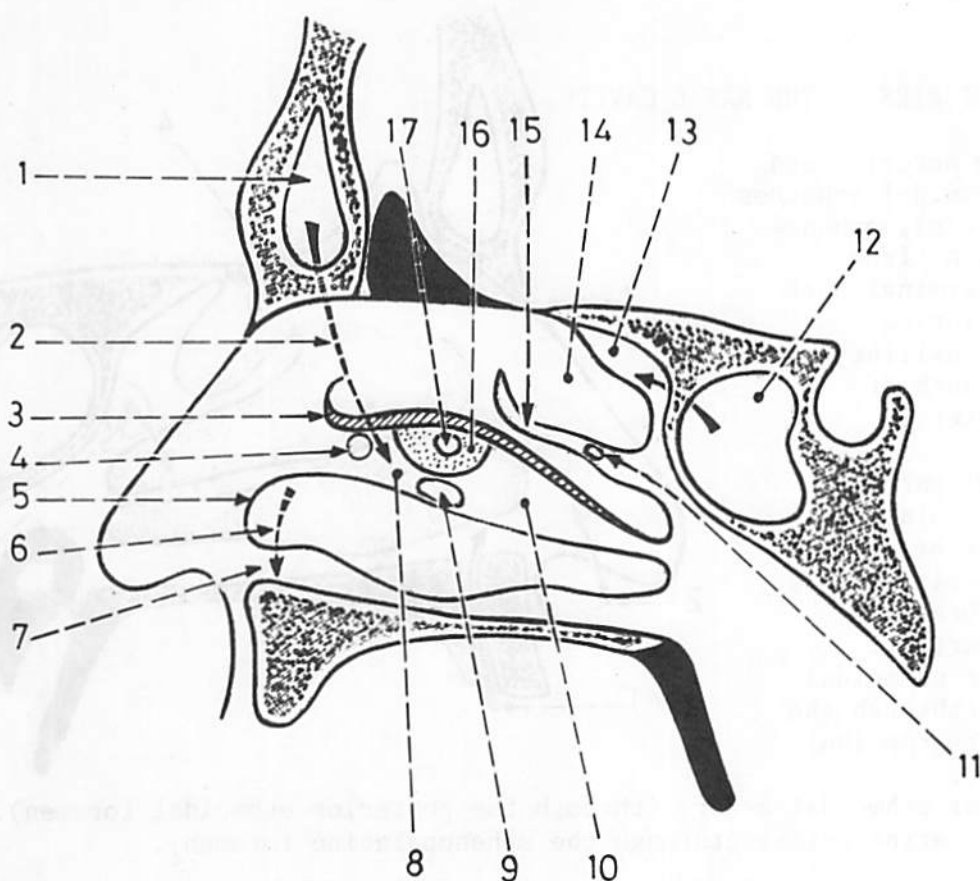


Fig.(686): OPENINGS IN THE NASAL MEATUSES

The spheno-ethmoidal recess receives the opening of the sphenoidal sinus.  
 The superior meatus receives the opening of the posterior ethmoidal sinus.  
 The middle meatus receives the openings of the maxillary air sinus, anterior ethmoidal sinus, middle ethmoidal sinus and frontal sinus (4 sinuses).  
 The inferior meatus receives the nasolacrimal duct.

1. frontal air sinus.
2. arrow in the ethmoidal infundibulum (a curved channel between the frontal sinus and the hiatus semilunaris).
3. middle concha (cut).
4. opening of anterior ethmoidal sinus (just in front of the bulla ethmoidalis).
5. inferior concha.
6. arrow in the lower end of the nasolacrimal duct.
7. inferior meatus.
8. hiatus semilunaris (a curved cleft below and in front of the bulla ethmoidalis).
9. opening of maxillary sinus (just below the bulla ethmoidalis).
10. middle meatus.
11. opening of posterior ethmoidal sinus.
12. sphenoidal sinus (opens into the spheno-ethmoidal recess).
13. spheno-ethmoidal recess.
14. superior concha.
15. superior meatus.
16. bulla ethmoidalis (a rounded elevation in the middle of the middle meatus).
17. opening of the middle ethmoidal sinus (on the bulla ethmoidalis).

Fig.(687): ARTERIES OF THE NASAL CAVITY

These are the anterior and posterior ethmoidal branches (from ophthalmic), sphenopalatine branch (from maxillary), terminal part of greater palatine artery (from maxillary) and septal branch of the facial artery.

1. terminal part of greater palatine artery (through the incisive canal).
2. septal branch of facial artery.
3. anterior ethmoidal artery (through the anterior ethmoidal foramen).
4. posterior ethmoidal artery (through the posterior ethmoidal foramen).
5. sphenopalatine artery (through the sphenopalatine foramen).

\* Three main arteries supply the nasal cavity: maxillary, ophthalmic and facial.

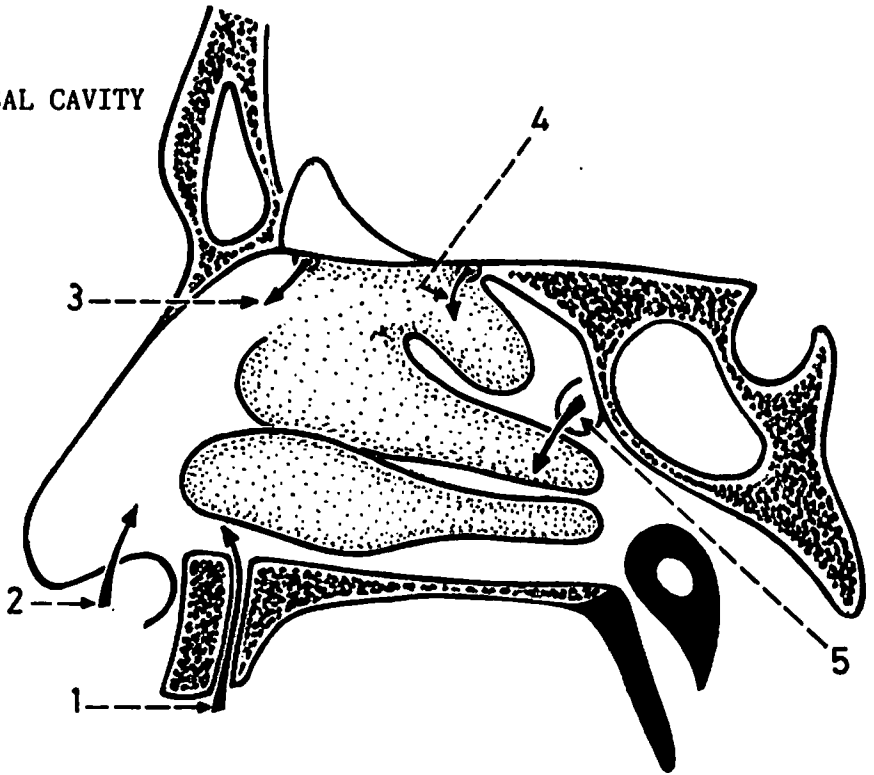


Fig.(688): AREA OF EPISTAXIS

It is a limited area at the most anterior part of the nasal septum in the region of the vestibule. It is the site where the sphenopalatine, greater palatine and septal branch of facial artery anastomose together and it is a common site of bleeding from the nose.

1. area of epistaxis.
2. septal branch of facial artery.
3. termination of greater palatine artery.
4. sphenopalatine artery.

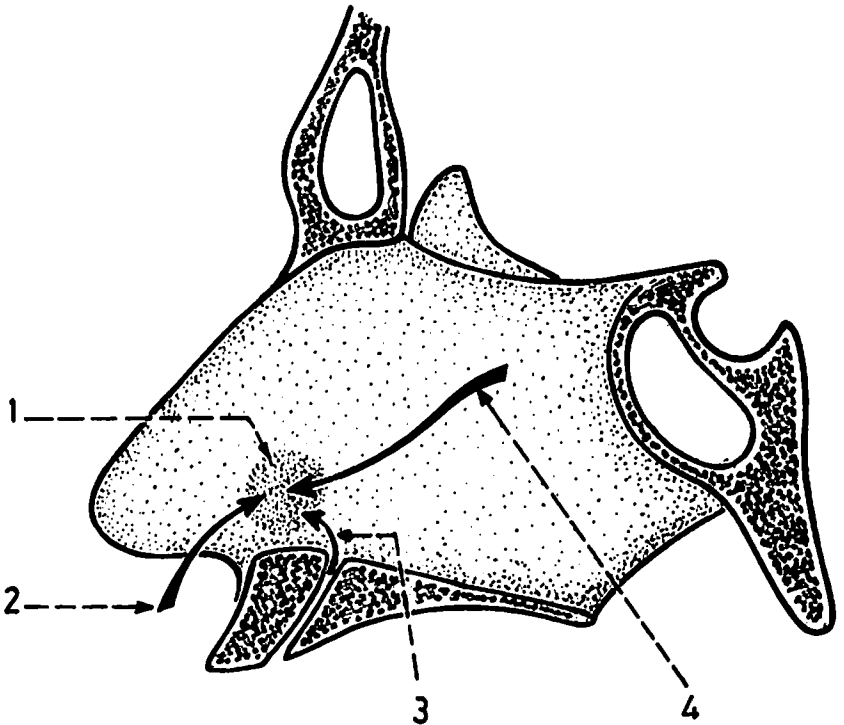
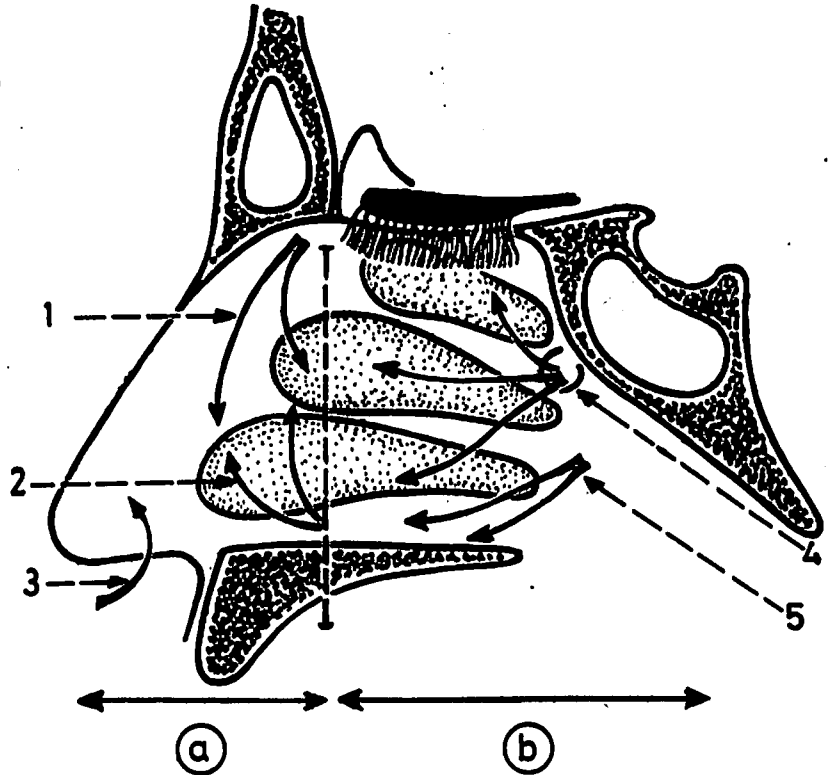


Fig.(689): NERVES OF LATERAL WALL OF NASAL CAVITY

With the exception of the nasociliary nerve, all the nerves supplying the nasal cavity are derived from the maxillary nerve (either directly or through the pterygo-palatine ganglion).



1. anterior ethmoidal branch of nasociliary.
2. branches from the anterior superior alveolar.
3. nasal branch from the infra-orbital nerve.
4. nasal branches from the pterygopalatine ganglion.
5. nasal branches from the greater palatine nerve.

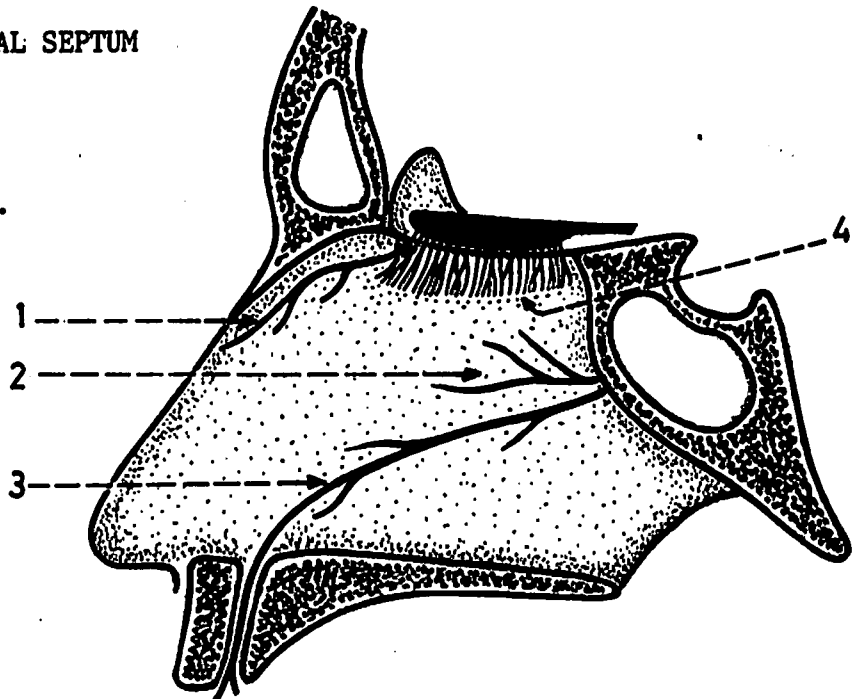
(a) anterior 1/3 : supplied by the anterior ethmoidal, infraorbital and anterior superior alveolar nerves.

(b) posterior 2/3 : supplied by branches from the pterygopalatine ganglion.

Fig.(690): NERVES OF THE NASAL SEPTUM

These are the nasopalatine nerve, nasal branches from the pterygopalatine ganglion and anterior ethmoidal nerve.

1. anterior ethmoidal nerve (from nasociliary).
2. nasal branches from the pterygopalatine ganglion.
3. nasopalatine nerve (from the pterygopalatine ganglion).
4. olfactory nerve (a number of bundles which pass through the cribriform plate of ethmoid to end in the olfactory bulb).



## PARANASAL SINUSES

Fig.(691): POSITION OF PARANASAL SINUSES

These sinuses are the frontal, ethmoidal, maxillary and sphenoidal. They are cavities within the bones of the skull and open into the nasal cavity. Their lining mucous membrane resembles that of the nasal cavity (columnar ciliated with goblet cells).

1. frontal air sinus (in the frontal bone).
2. ethmoidal air sinus (in the ethmoid bone).
3. maxillary air sinus (in the maxilla).

\* The sphenoidal air sinus lies in the body of sphenoid bone (not seen in the figure).

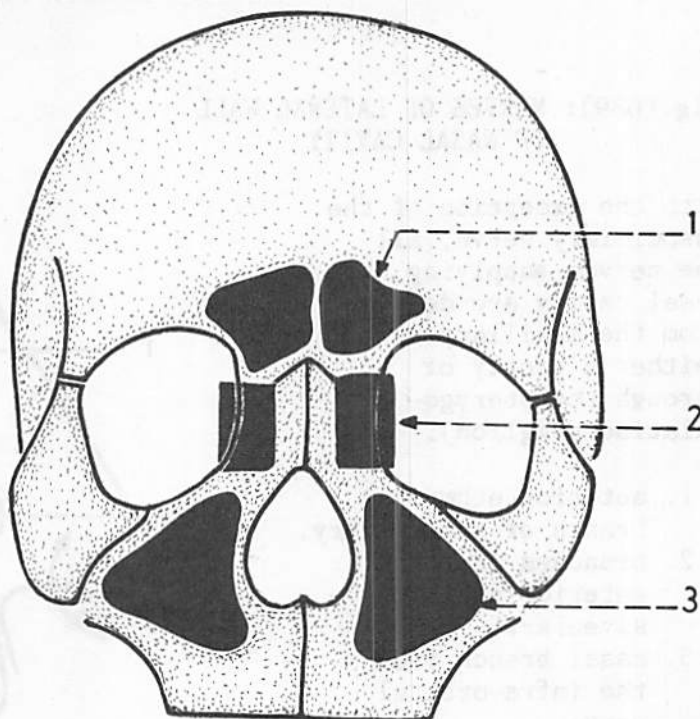


Fig.(692): ETHMOIDAL AIR SINUSES

These are thin-walled cavities that are arranged in 3 groups (anterior, middle and posterior).

1. crista galli.
2. anterior ethmoidal group.
3. middle ethmoidal group.
4. posterior ethmoidal group.
5. lateral wall of nasal cavity.
6. nasal septum.

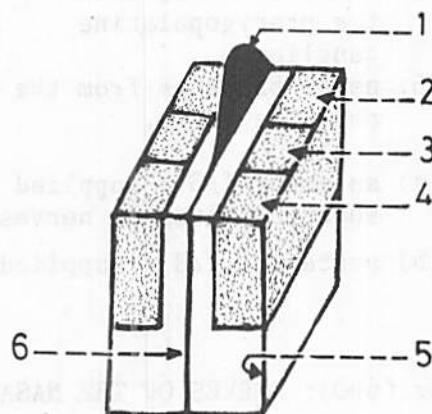
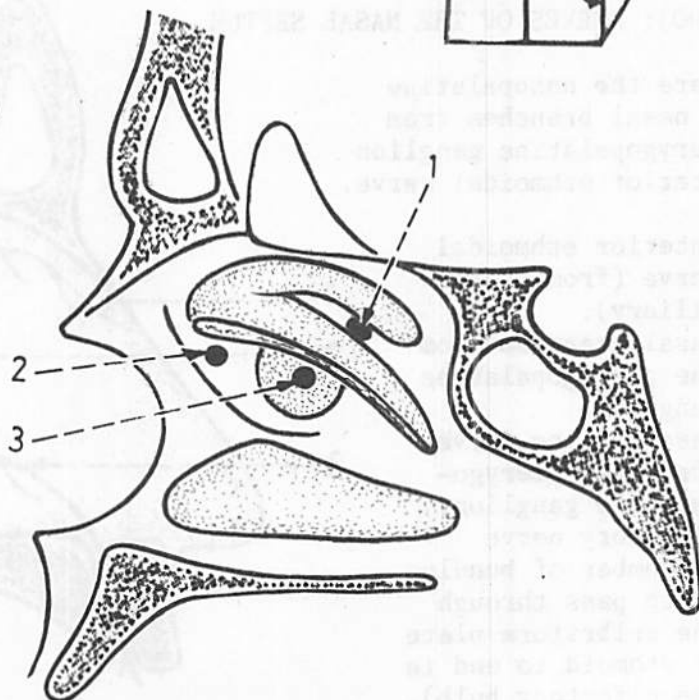


Fig.(693): OPENINGS OF ETHMOIDAL SINUSES

1. opening of posterior ethmoidal sinus (in the superior meatus).
2. opening of anterior ethmoidal sinus (in the middle meatus just in front of the bulla ethmoidalis).
3. opening of middle ethmoidal sinus (on the surface of the bulla ethmoidalis).



\* The bulla ethmoidalis is formed by the middle ethmoidal sinus



Fig.(694): SHAPE OF MAXILLARY AIR SINUS

It is pyramidal in shape with its base directed medially and its apex directed laterally.

1. roof of the sinus (forms the floor of the orbit).
2. apex of the sinus.
3. floor of the sinus (lies 1 cm below the level of the floor of the nasal cavity).
4. base of the sinus (formed by the lateral wall of the nasal cavity).

The roots of the 1st and 2nd molar teeth form elevations into the floor of the sinus.

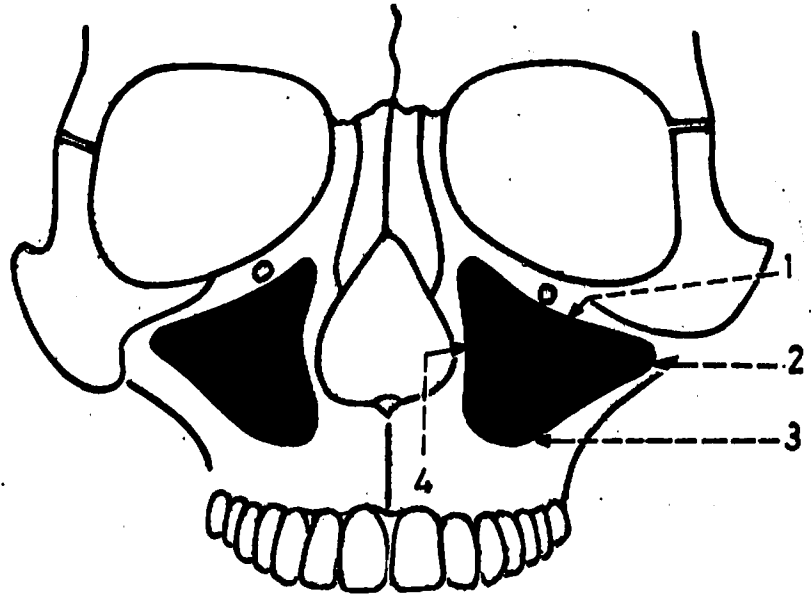


Fig.(695): ORIFICE OF THE MAXILLARY SINUS

It lies in the upper part of the base of the sinus and opens into the middle meatus of the nose.

1. orifice of maxillary sinus.
2. floor of the sinus.

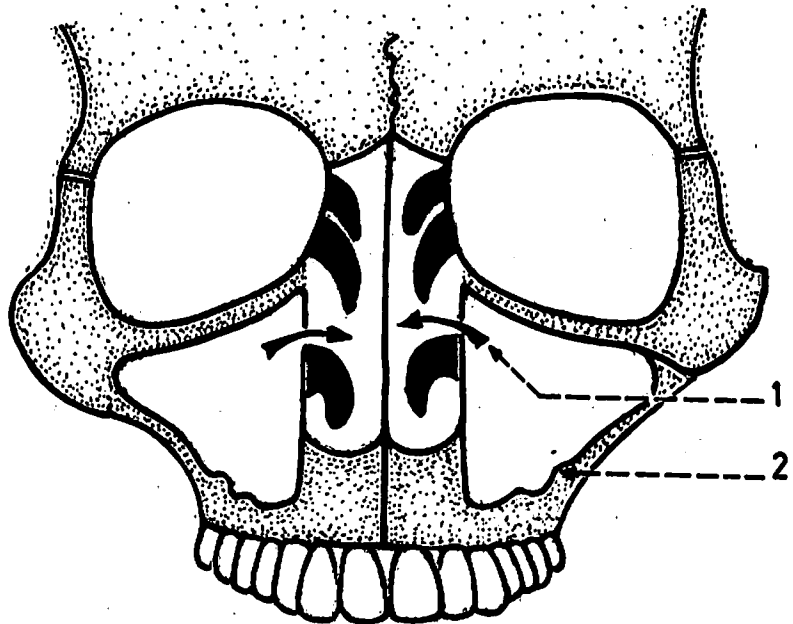


Fig.(696): NERVES RELATED TO THE MAXILLARY SINUS

1. anterior superior alveolar nerve (in the anterior wall).
2. infraorbital nerve (in the roof).
3. greater palatine nerve (behind the sinus).
4. posterior superior alveolar nerve (in the posterior wall).
5. middle superior alveolar nerve (in the lateral wall).

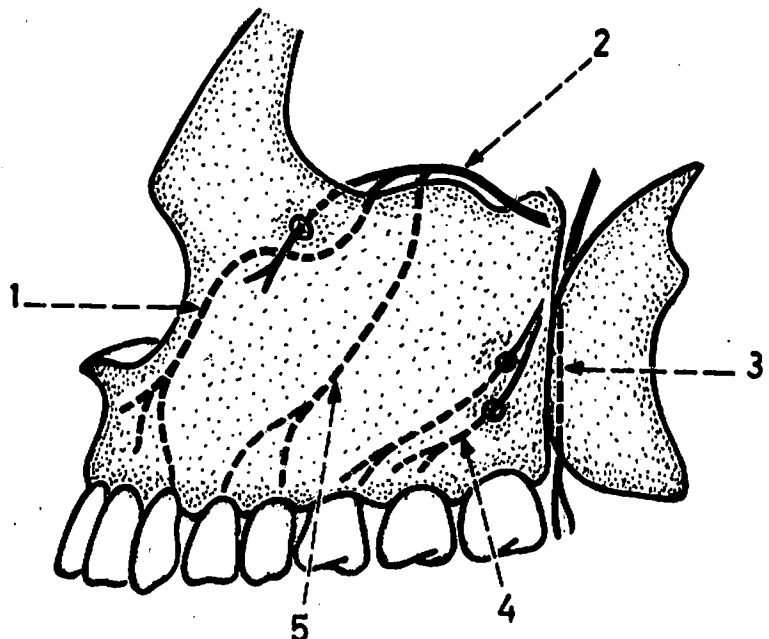


Fig.(697): FRONTAL AIR SINUS

There are 2 frontal sinuses present in the frontal bone directly behind the superciliary arches. Each sinus opens directly into the anterior part of the middle meatus of the nose or through the ethmoidal infundibulum.

1. frontal air sinus.
2. arrow in the ethmoidal infundibulum.
3. middle meatus of the nose.
4. bulla ethmoidalis.
5. middle concha (cut).

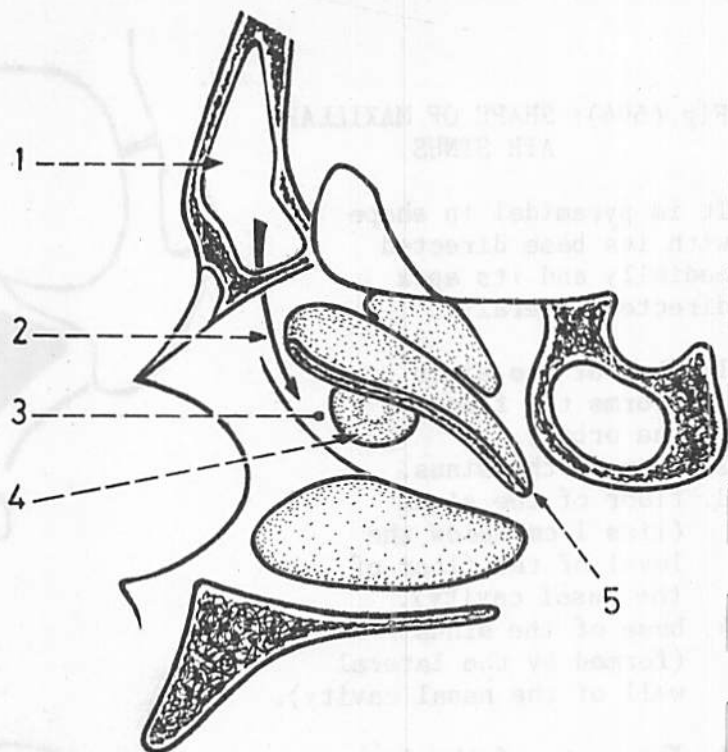


Fig.(698): SPHENOIDAL AIR SINUS

There are 2 sphenoidal sinuses placed within the body of the sphenoid bone. They are rarely symmetrical and each sinus opens into the sphenoethmoidal recess of the nasal cavity.

1. pituitary gland.
2. cavernous sinus.
3. internal carotid artery.
4. sphenoidal air sinus.
5. bony septum between the 2 sphenoidal sinuses.

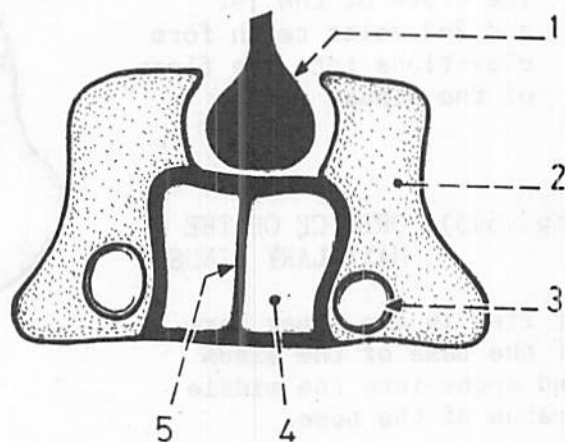
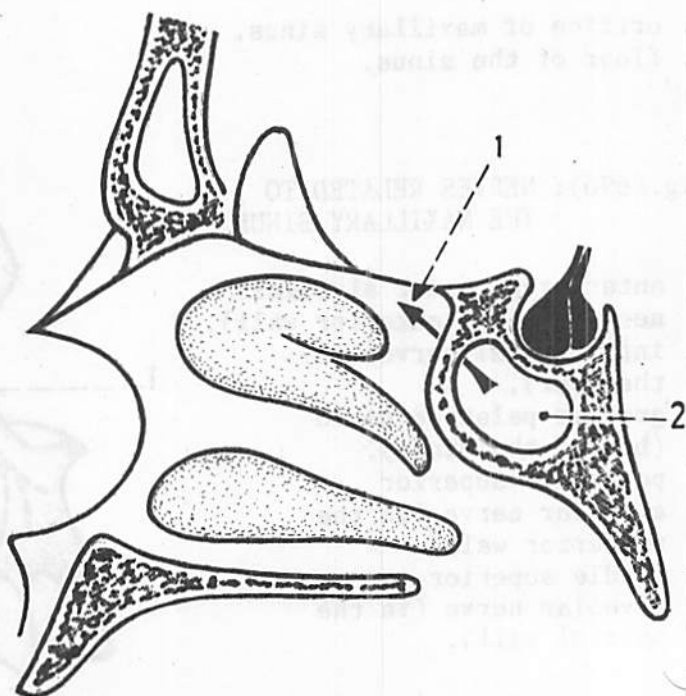


Fig.(699): OPENING OF THE SPHENOIDAL SINUS

This sinus opens into the sphenoethmoidal recess which is a triangular space situated above the superior concha of the nose.

1. sphenoethmoidal recess.
2. sphenoidal air sinus.



# EAR

## EXTERNAL EAR

Fig.(700): PARTS OF THE EXTERNAL EAR

It consists of the auricle and external acoustic meatus.

1. auricle.
2. external acoustic meatus.
3. middle ear (between the external ear and the internal ear).
3. internal ear (the deepest).

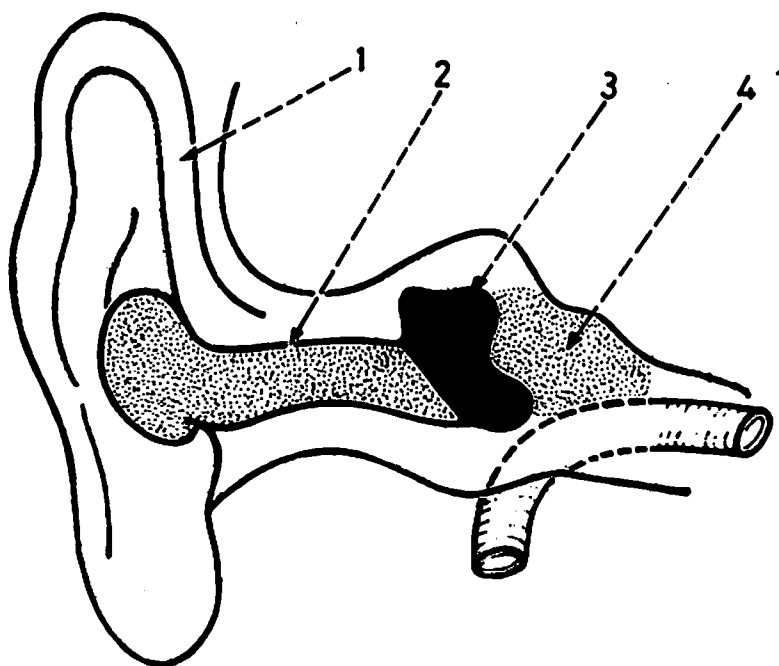


Fig.(701): AURICLE OF THE EAR

It consists of a plate of elastic fibro-cartilage except the lobule which consists of fibrofatty tissue.

1. scaphoid fossa.
2. triangular fossa.
3. concha of the auricle.
4. tragus.
5. antitragus.
6. lobule of the ear.
7. antihelix.
8. helix.

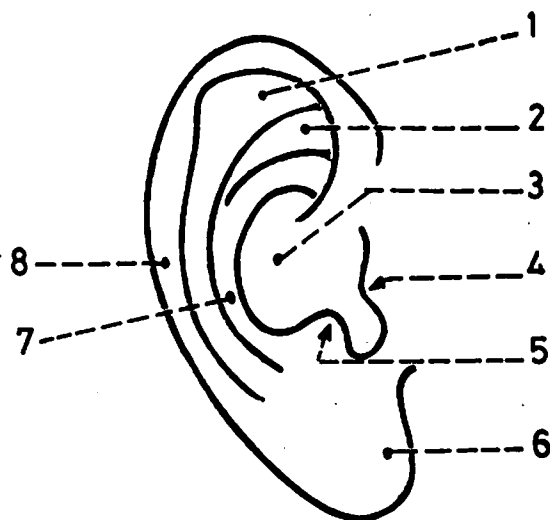
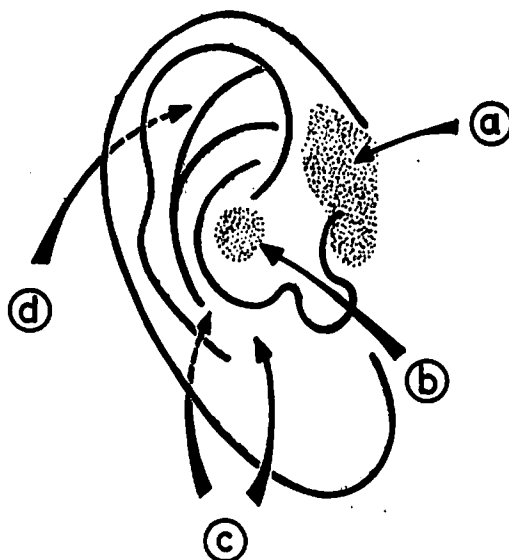


Fig.(702): SENSORY NERVES OF THE AURICLE

These are the auriculotemporal, great auricular, lesser occipital and auricular branch of the vagus.

- (a) auriculotemporal nerve (from mandibular).
- (b) auricular branch of vagus.
- (c) great auricular nerve (C.2,3).
- (d) lesser occipital nerve (C.2).



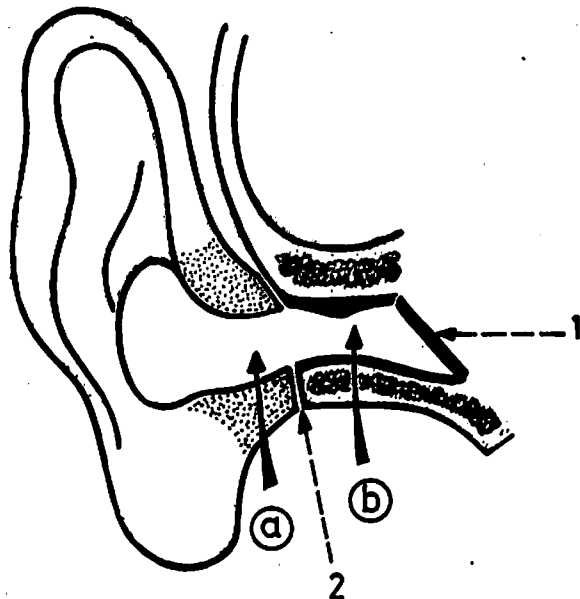
**Fig.(703): PARTS OF THE EXTERNAL ACOUSTIC MEATUS**

The external acoustic (auditory) meatus consists of 2 parts: an outer cartilagenous part and an inner osseous part.

(a) cartilagenous part (lateral 1/3).

(b) osseous part (medial 2/3).

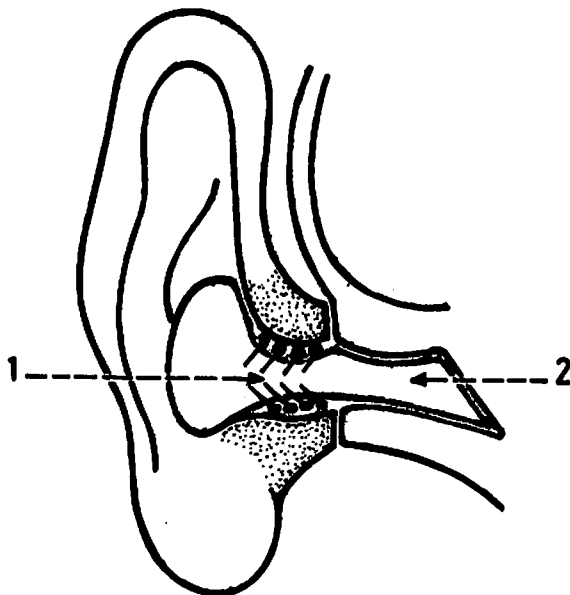
1. tympanic membrane.
2. junction between the 2 parts of the meatus.



**Fig.(704): LINING OF THE EXTERNAL ACOUSTIC MEATUS**

It is lined with skin which extends to cover the outer surface of the tympanic membrane.

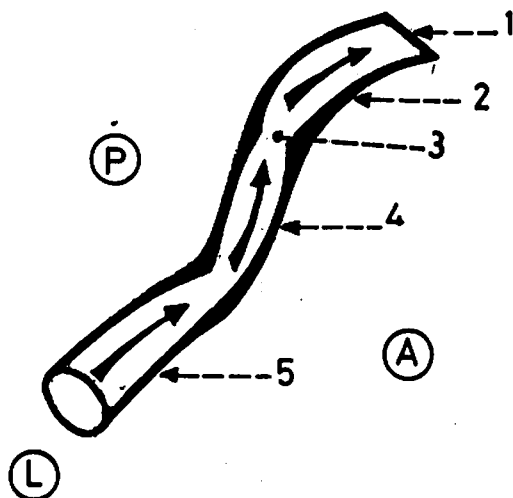
1. cartilagenous part: its skin contains numerous ceruminous glands which secrete the ear-wax; it also contains hair.
2. osseous part: its skin contains neither hair nor ceruminous glands.



**Fig.(705): SHAPE AND DIRECTION OF THE EXTERNAL ACOUSTIC MEATUS**

It measures  $2\frac{1}{2}$  cm and forms an S-shaped curve. It is directed at first medially and forwards (outer part); then medially, backwards and upwards (middle part) and then medially, forwards and downwards (inner part).

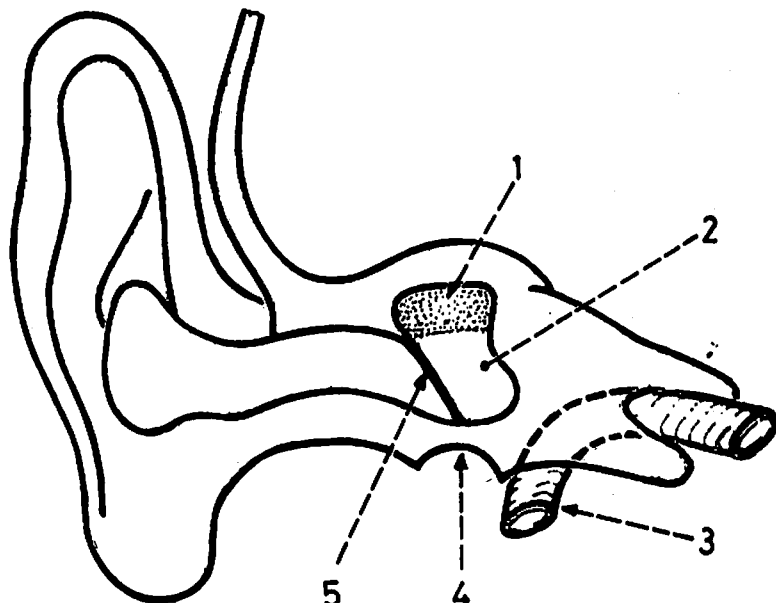
1. tympanic membrane.
2. inner part.
3. isthmus.
4. middle part.
5. outer part.



## MIDDLE EAR

Fig.(706): PARTS OF THE MIDDLE EAR

The middle ear (tympanic cavity) is a space situated inside the temporal bone. It consists of the tympanic cavity proper (on level with the tympanic membrane) and epitympanic recess (above the level of the tympanic membrane).



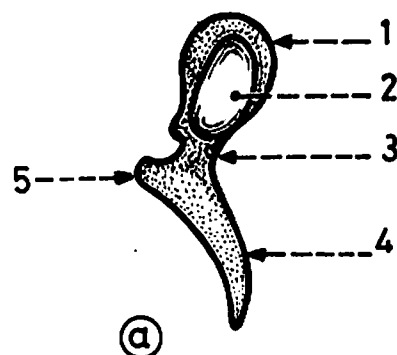
1. epitympanic recess.
2. tympanic cavity proper.
3. internal carotid artery.
4. fossa for superior bulb of internal jugular vein.
5. tympanic membrane.

Fig.(707): OSSICLES OF THE MIDDLE EAR

These are the malleus, incus and stapes.

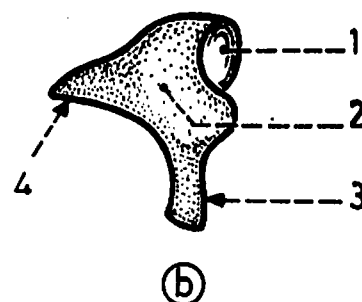
(a) malleus: it is the largest and resembles a hammer.

1. head of malleus.
2. facet for articulation with the incus.
3. neck.
4. handle.
5. lateral process.



(b) incus: it consists of a body and 2 processes.

1. facet for articulation with the malleus.
2. body of incus.
3. long process.
4. short process.



(c) stapes: it is the smallest and most medial in position.

1. head of stapes.
2. neck.
3. base (fixed to the margin of the fenestra vestibuli).

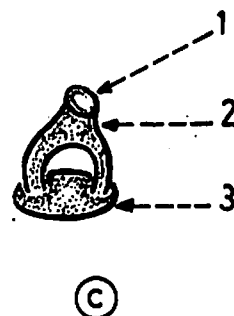


Fig.(708): THE 3 OSSICLES ARTICULATED

The head of the malleus articulates with the incus, and the long process of the incus articulates with the head of the stapes.

1. body of incus.
2. long process of incus.
3. stapes.
4. handle of malleus.
5. head of malleus.

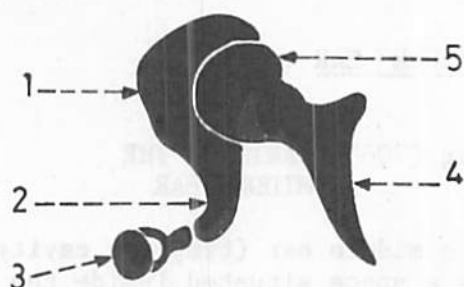


Fig.(709): POSITION OF THE 3 OSSICLES IN THE MIDDLE EAR

The malleus is the lateral bone and is attached by its handle to the tympanic membrane. The base of the stapes is fixed to the fenestra vestibuli in the medial wall of the middle ear. The upper 1/2 of the malleus and most of the incus lie in the epitympanic recess above the level of the tympanic membrane.

1. base of the stapes in the fenestra vestibuli.
2. promontory.
3. handle of the malleus.
4. tympanic membrane (forms the lateral wall of the middle ear).
5. epitympanic recess.

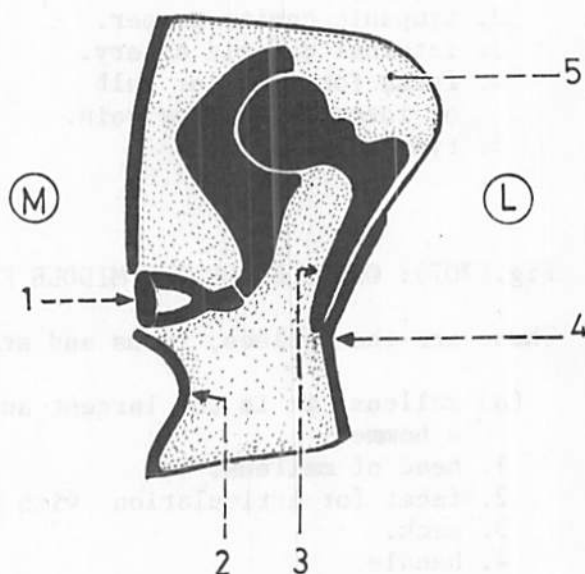


Fig.(710): MUSCLES ATTACHED TO THE OSSICLES OF THE EAR

The tensor tympani is inserted into the upper end of the handle of the malleus, while the stapedius is inserted into the neck of the stapes.

1. stapedius.
2. stapes.
3. incus.
4. handle of malleus.
5. tensor tympani.

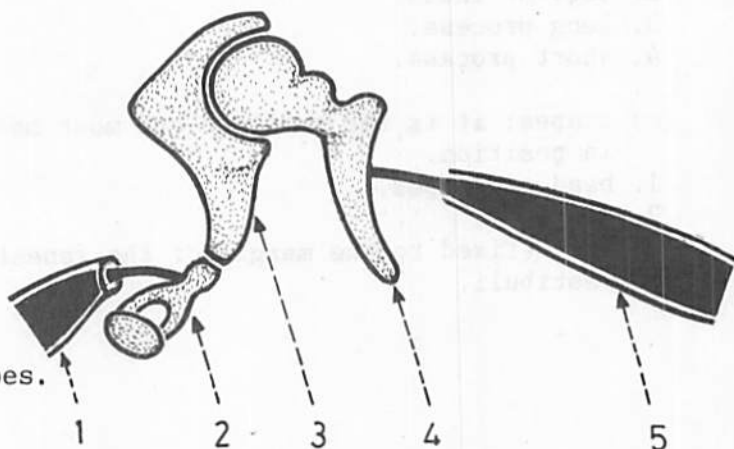


Fig.(711): COMMUNICATIONS OF  
THE MIDDLE EAR

The middle ear communicates posteriorly with the mastoid antrum through the aditus to the antrum and anteriorly with the nasopharynx through the auditory tube.

1. mastoid antrum.
2. middle ear.
3. auditory tube.

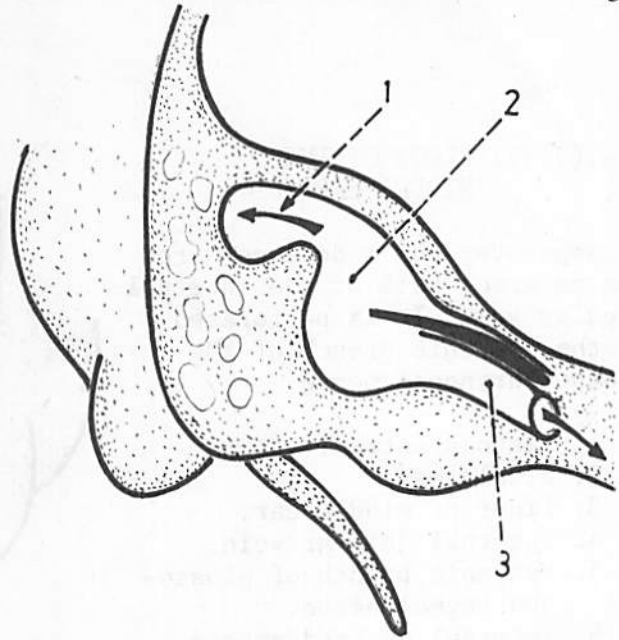


Fig.(712): ROOF OF THE MIDDLE EAR

It is called tegmen tympani and separates the middle ear from the middle cranial fossa. It extends backwards to form the roof of the mastoid antrum and forwards to form the roof of the canal for tensor tympani muscle.

1. roof of the mastoid antrum.
2. roof of the middle ear.
3. roof of the canal for tensor tympani.

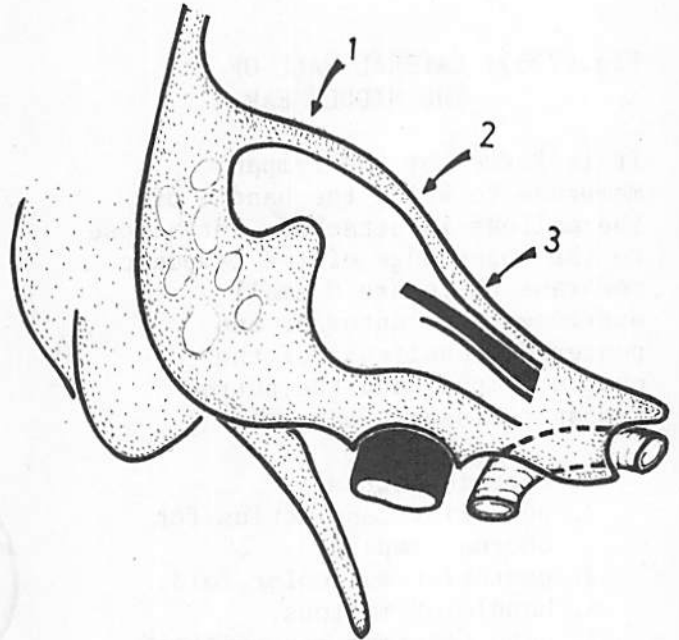


Fig.(713): ROOF OF TYMPANIC CAVITY  
IN YOUNG CHILDREN

In young children the suture between the petrous and squamous parts of temporal bone is still unossified (marked by the arrow). This suture allows direct spread of infection from the middle ear to the temporal lobe of the brain.

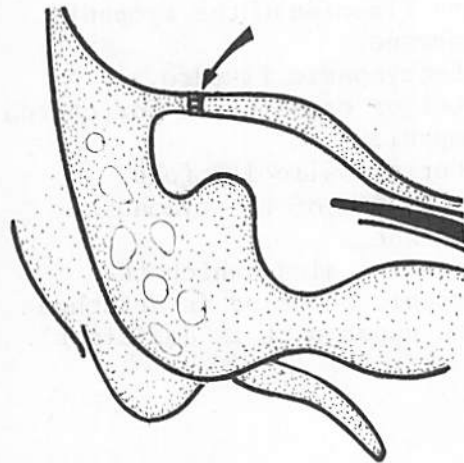




Fig.(714): FLOOR OF THE  
MIDDLE EAR

It separates the middle ear from the superior bulb of the internal jugular vein. It is perforated by the tympanic branch of the glossopharyngeal nerve.

1. mastoid antrum.
2. middle ear.
3. floor of middle ear.
4. internal jugular vein.
5. tympanic branch of glossopharyngeal nerve.
6. internal carotid artery.

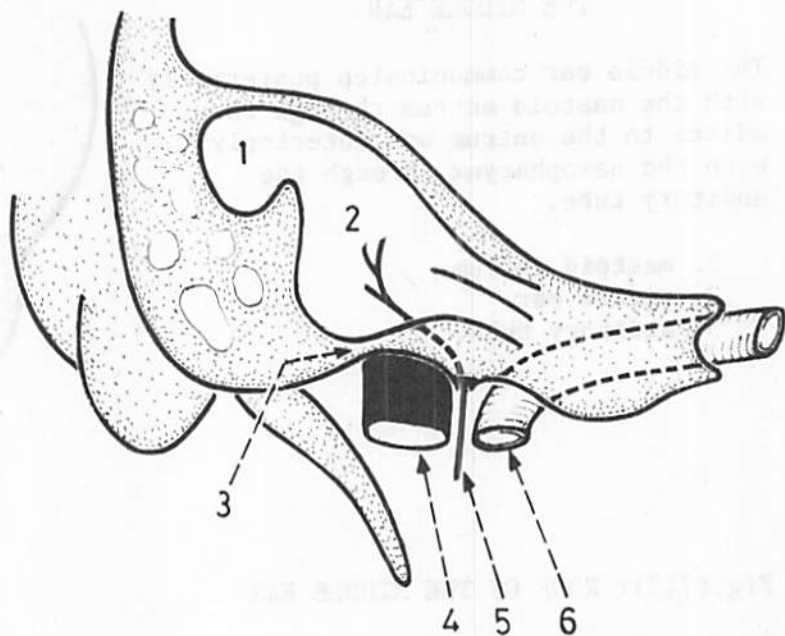


Fig.(715): LATERAL WALL OF  
THE MIDDLE EAR

It is formed by the tympanic membrane to which the handle of the malleus is attached. Very close to the upper edge of the tympanic membrane there are 3 small apertures: the anterior and posterior canaliculi of the chorda tympani and the petro-tympanic fissure.

1. mastoid antrum.
2. posterior canaliculus for chorda tympani.
3. posterior malleolar fold.
4. handle of malleus.
5. umbo (maximum convexity of the tympanic membrane).
6. pars flaccida of the tympanic membrane.
7. petrotympanic fissure.
8. anterior canaliculus for chorda tympani.
9. anterior malleolar fold.
10. pars tensa of the tympanic membrane.
11. bony ring along which the tympanic membrane is attached (its upper part is deficient).

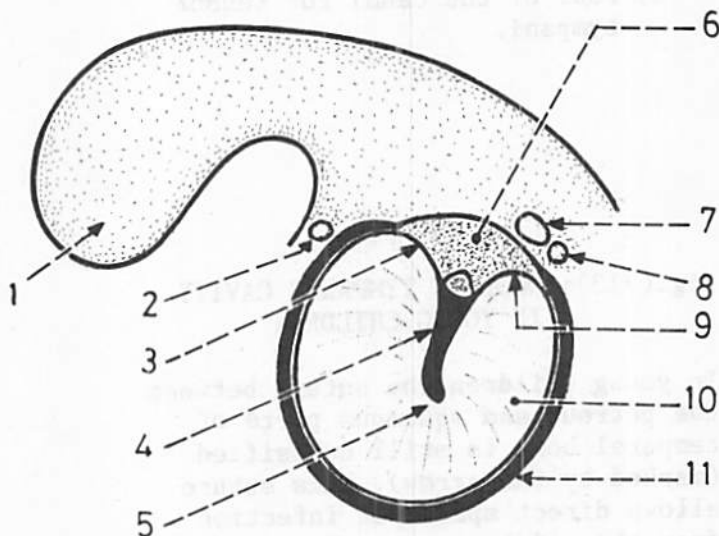




Fig.(717): OUTER SURFACE OF TYMPANIC MEMBRANE

The tympanic membrane (ear drum) is divided into 2 parts: a small triangular upper part called pars flaccida and a larger lower part called pars tensa. The handle of the malleus is attached to the inner surface of the membrane extending from above downwards as far as the centre of the membrane.

1. pars flaccida (lax and thin).
2. handle of the malleus (attached to the inner surface of the membrane).
3. pars tensa.
4. cone of light (an area of reflected light seen clinically in the living at the antero-inferior quadrant of the membrane).

\* Note that the membrane is concave laterally and convex medially, and the point of maximum convexity is called umbo.

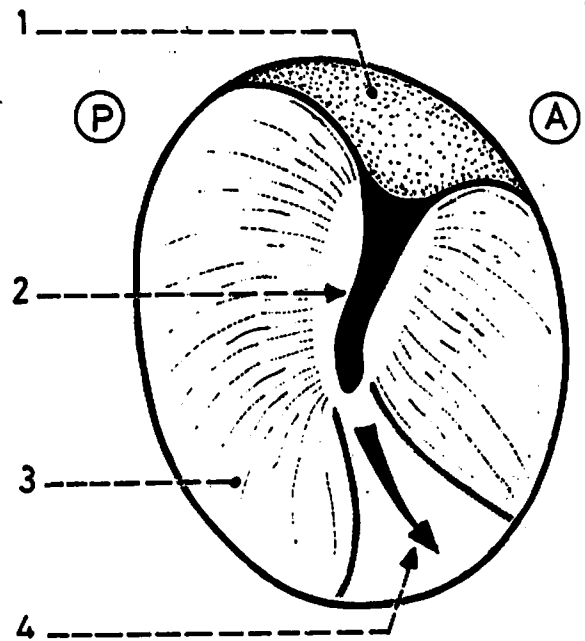


Fig.(718): NERVE SUPPLY OF TYMPANIC MEMBRANE

Its outer surface is supplied by the auriculotemporal nerve and auricular branch of vagus, while its inner surface is supplied by the tympanic branch of the glossopharyngeal nerve.

1. auriculotemporal nerve.
2. auricular branch of vagus.
3. tympanic branch of glossopharyngeal nerve.

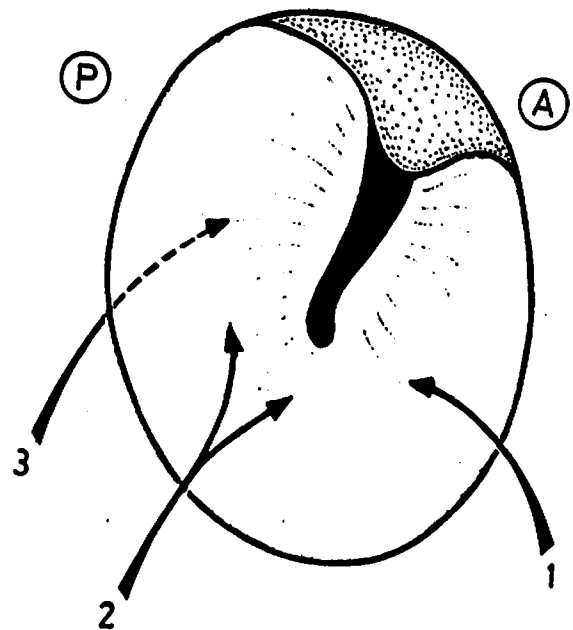


Fig.(719): SAFE AREA FOR INCISIONS

The lower part of the membrane is safer for incisions than the upper part.

1. upper part: more vascular, related to the ossicles and to the chorda tympani nerve.
2. lower part: safe.

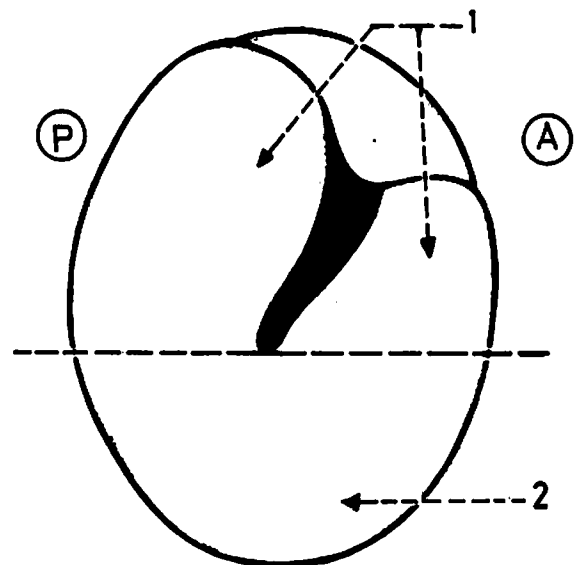


Fig.(720): MEDIAL WALL OF THE MIDDLE EAR

It shows 4 main features: promontory, elevation of the facial canal and 2 openings (fenestra vestibuli and fenestra cochleae).

1. elevation of the facial canal (runs from before backwards in the upper part of the medial wall and lodges the facial nerve).
2. fenestra vestibuli (lies above the promontory and leads into the vestibule of the internal ear).
3. promontory (a rounded elevation produced by the base of the cochlea).
4. fenestra cochleae (below the promontory and leads into the scala tympani of the cochlea).

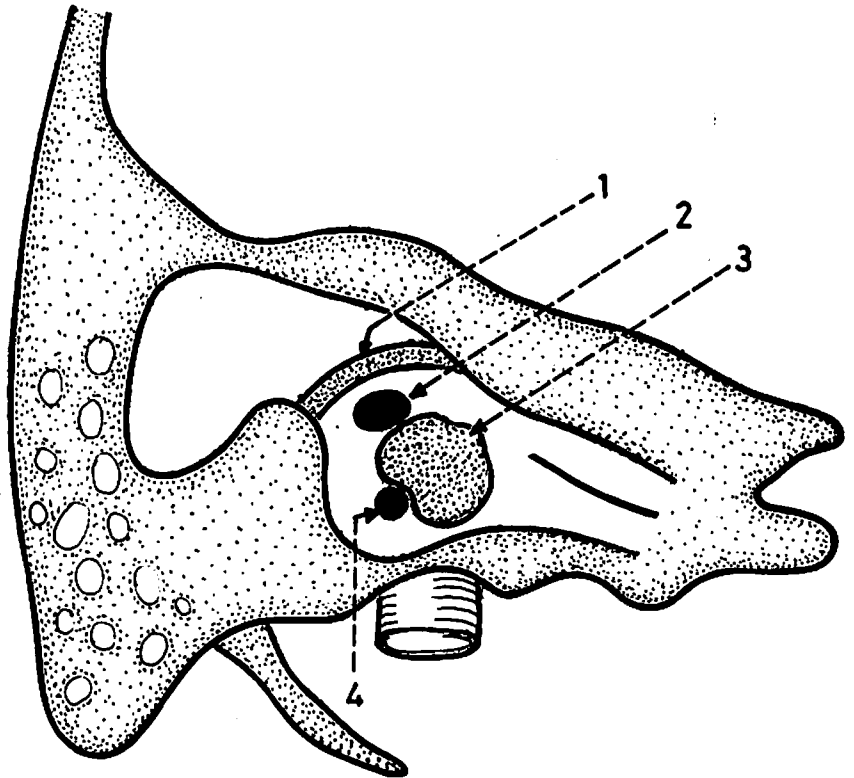


Fig.(721): POSTERIOR WALL OF THE MIDDLE EAR

It shows 3 main features: aditus to mastoid antrum, pyramid and lower part of the facial canal.

1. aditus to mastoid antrum.
2. elevation of the lateral semicircular canal (in the medial wall of the aditus).
3. elevation of the facial canal as it curves downwards in the posterior wall of the middle ear.
4. canaliculus for chorda tympani.
5. pyramid (filled with the stapedius muscle).
6. vertical part of facial canal transmitting the facial nerve.

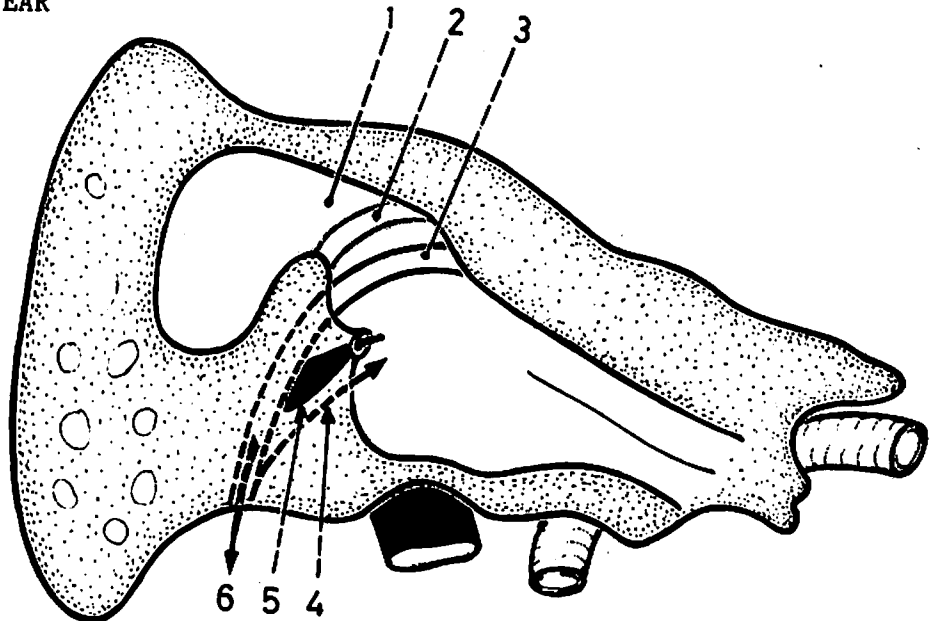
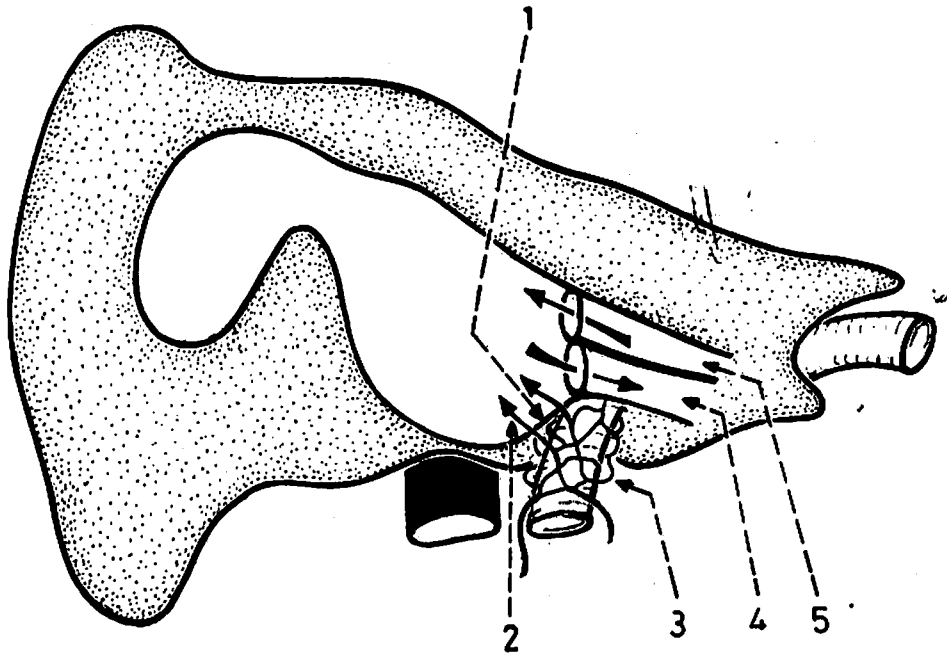


Fig.(722): ANTERIOR WALL  
OF THE MIDDLE  
EAR

The lower part of the anterior wall is a plate of bone separating the middle ear from the internal carotid artery. The upper part of the wall shows the auditory tube below and canal for the tensor tympani above.



1. lower part of anterior wall.
2. carotico-tympanic nerves piercing the lower part of anterior wall.
3. sympathetic plexus around the internal carotid artery.
4. bony part of auditory tube.
5. canal for tensor tympani muscle.

Fig.(723): MASTOID ANTRUM

It is an air space present just behind the epitympanic recess with which it communicates through the aditus.

1. vertical part of facial canal.
2. sigmoid sinus (behind the antrum).
3. mastoid antrum.
4. posterior semicircular canal (medial to the antrum).
5. aditus to the antrum.
6. lateral semicircular canal (medial to the aditus).
7. horizontal part of facial canal (in the upper part of the medial wall of the middle ear).

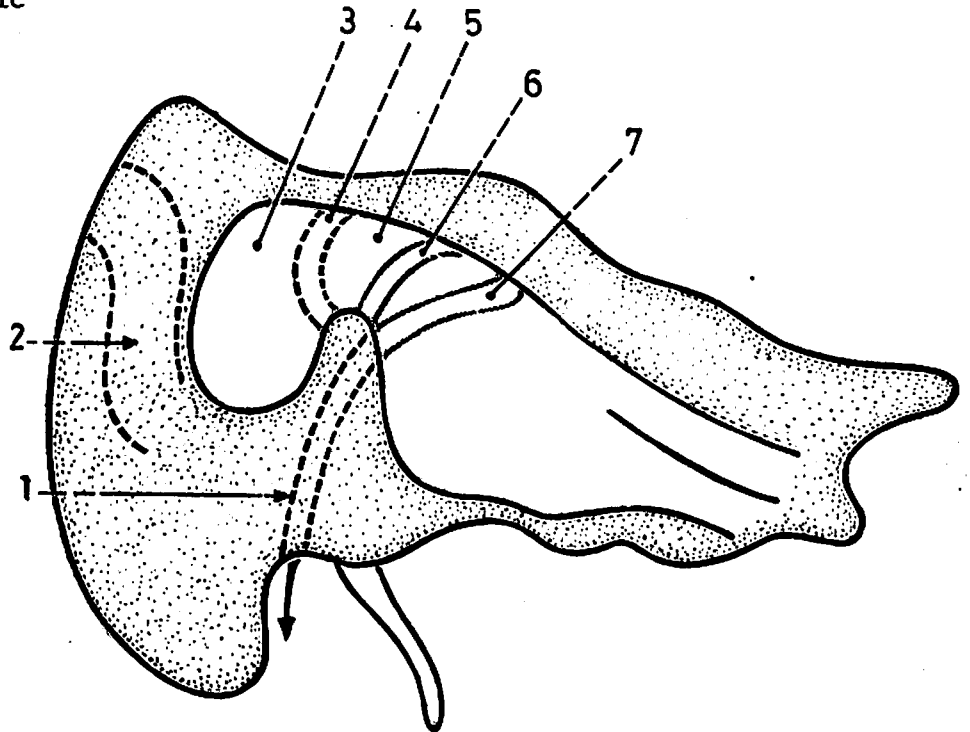


Fig.(724): MUSCLES WITHIN THE MIDDLE EAR

These are the stapedius and tensor tympani.

1. stapedius muscle (inserted into the neck of the stapes).
2. tensor tympani (inserted into the handle of the malleus).

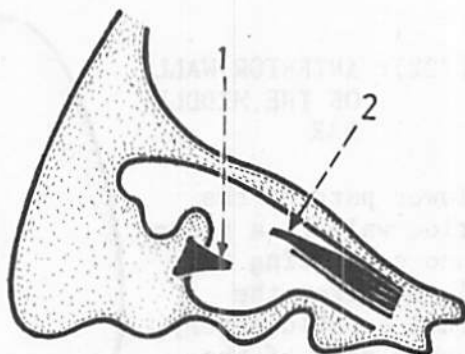


Fig.(725): TYMPANIC PLEXUS OF NERVES

It is formed by the tympanic branch of glossopharyngeal nerve and carotico-tympanic branches from the sympathetic plexus around the internal carotid artery.

1. tympanic plexus (lies on the promontory).
2. lesser petrosal nerve (arises from the tympanic plexus and leaves the middle ear by piercing the petrous bone).
3. sympathetic plexus around the internal carotid artery (gives carotico-tympanic nerves to the plexus).
4. tympanic branch of the glossopharyngeal nerve (carries sensory and parasympathetic fibres).

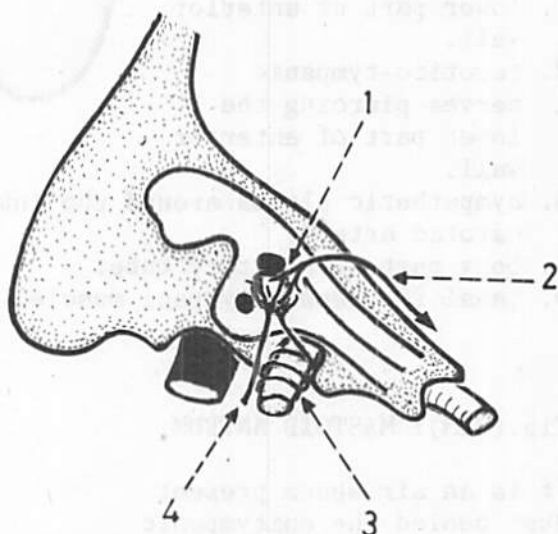


Fig.(726): CHORDA TYMPANI IN THE MIDDLE EAR

In the middle ear, the chorda tympani lies on the inner surface of the tympanic membrane where it crosses the handle of the malleus.

1. incus.
2. malleus.
3. chorda tympani.
4. anterior canaliculus.
5. tendon of tensor tympani muscle.
6. posterior canaliculus.
7. chorda tympani in the posterior canaliculus.
8. vertical part of facial canal.

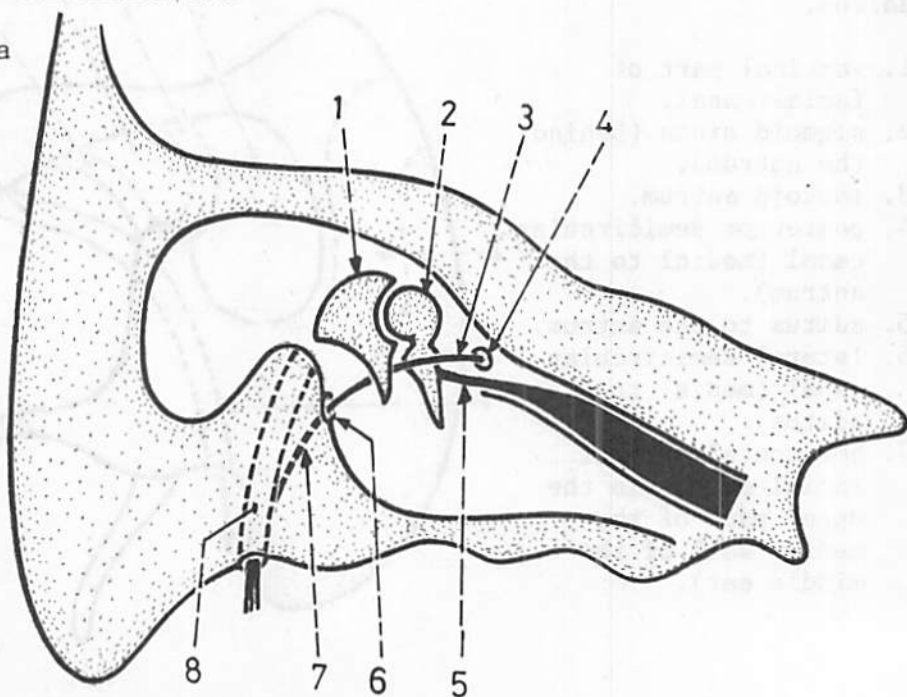


Fig.(727): ARTERIES OF THE MIDDLE EAR

There are many arteries for the middle ear of which 2 are the largest in size: anterior tympanic branch of maxillary artery and stylomastoid branch of posterior auricular artery.

1. stylomastoid branch of the posterior auricular artery (enters the middle ear through the stylomastoid foramen).
2. anterior tympanic branch of maxillary artery (enters the middle ear through the petro-tympanic fissure).
3. tympanic branch from internal carotid artery (arises in the carotid canal and pierces the anterior wall of the middle ear).

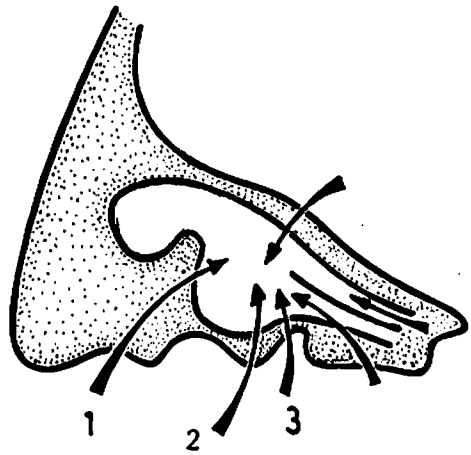


Fig.(728): SPREAD OF INFECTION FROM THE MIDDLE EAR

Infection in the middle ear may spread to the middle cranial fossa, the posterior cranial fossa or the facial canal.

1. spread to the middle cranial fossa (leads to abscess in the temporal lobe of the brain).
2. spread to the facial canal.
3. spread to the posterior cranial fossa (leads to thrombosis of the sigmoid sinus).

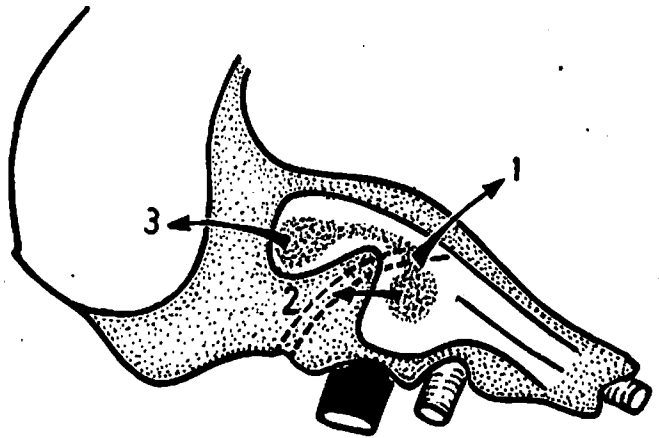


Fig.(729): BLEEDING FROM THE EAR IN FRACTURE OF THE MIDDLE CRANIAL FOSSA

In such a case the roof of the middle ear is fractured and the tympanic membrane is ruptured leading to bleeding from the ear.

1. middle ear.
2. fracture of the base of the skull in the middle cranial fossa.

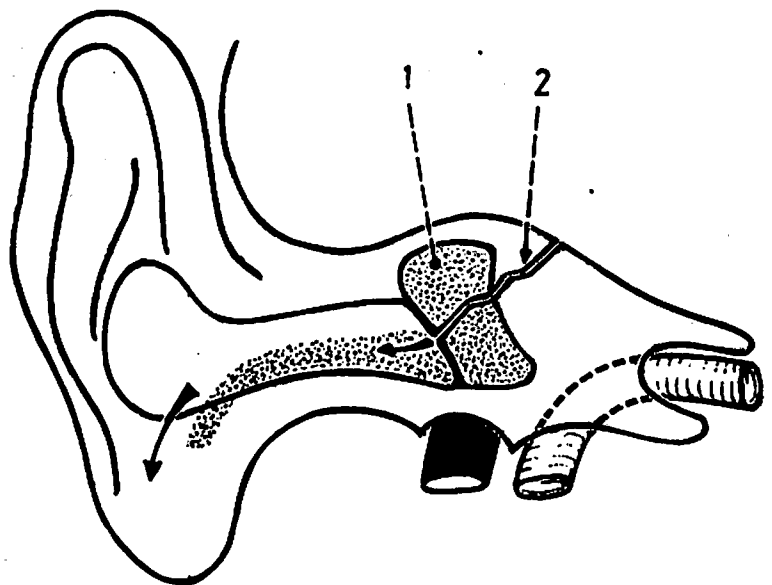


Fig.(730): AUDITORY (PHARYNGOTYMPANIC) TUBE

It communicates the middle ear with the nasopharynx. It is directed downwards, forwards and medially. Its lateral 1/3 is bony while its medial 2/3 is cartilagenous

1. tubal tonsil (mass of lymphoid tissue).
2. pharyngeal orifice (forms the tubal elevation).
3. cartilagenous part of the tube (medial 2/3).
4. isthmus of the tube (the narrowest part, at the junction between the bony and cartilagenous parts).
5. bony part of the tube (lateral 1/3).
6. opening of the tube into the middle ear.

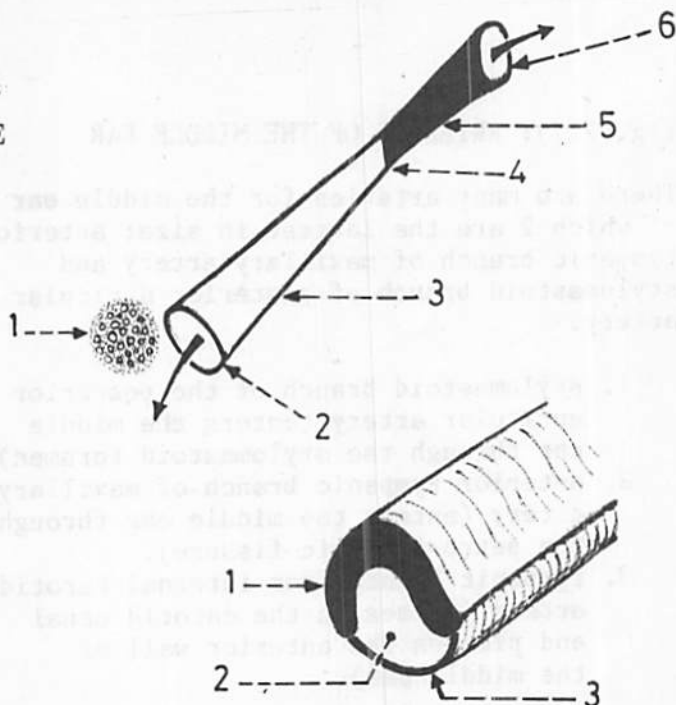


Fig.(731): CARTILAGENOUS PART OF THE TUBE

Its wall is not formed completely of cartilage but its lower part is fibrous.

1. cartilagenous part of the wall.
2. lumen of the tube.
3. fibrous part of the wall

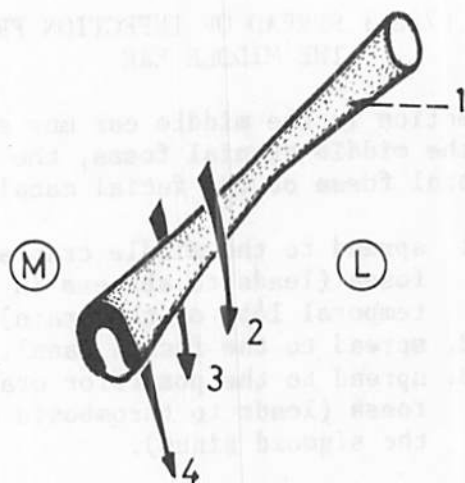


Fig.(732): MUSCLES RELATED TO THE TUBE

1. bony part of the tube.
2. tensor palati (lateral).
3. levator palati (medial).
4. salpingopharyngeus (attached to the pharyngeal orifice).

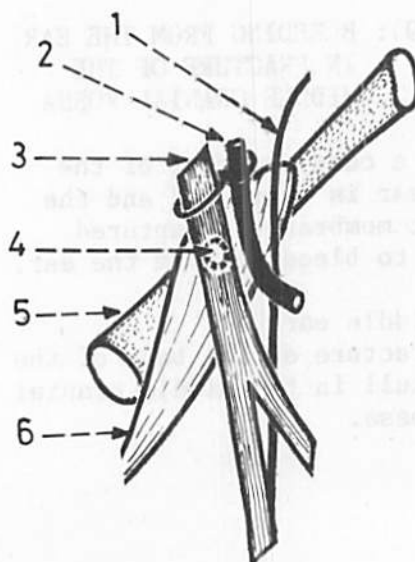


Fig.(733): LATERAL RELATIONS OF THE TUBE

The tensor palati separates the tube from the mandibular nerve, otic ganglion, middle meningeal artery and chorda tympani.

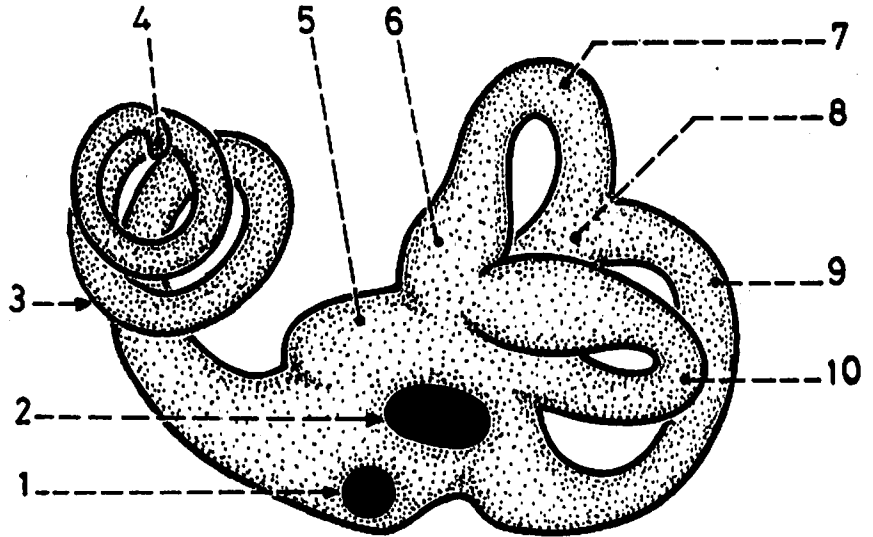
1. chorda tympani nerve.
2. middle meningeal artery.
3. mandibular nerve.
4. otic ganglion.
5. auditory tube.
6. tensor palati muscle.

INTERNAL EAR (LABYRINTH)

Fig.(734): BONY LABYRINTH

It consists of the vestibule (central part), cochlea (in front) and 3 semi-circular canals (above and behind). It contains the membranous labyrinth.

1. fenestra cochleae (for the 2ry tympanic membrane).
2. fenestra vestibuli (for the stapes).
3. base of the cochlea.
4. apex of cochlea (cupola).
5. vestibule.
6. ampulla of a semi-circular canal.
7. superior (anterior) semicircular canal.
8. crus commune (union between the superior and posterior semicircular canals).
9. posterior semicircular canal.
10. lateral semicircular canal.



\* Note that the 3 semicircular canals open into the vestibule by 5 orifices only.

Fig.(735): VESTIBULE OF THE BONY LABYRINTH

It is the central part of the bony labyrinth having the cochlea in front and the semicircular canals behind. Its medial wall is related to the middle ear, while its lateral wall is related to the bottom of the internal acoustic meatus. The facial canal crosses above the roof of the vestibule.

1. vestibule.
2. cochlea (in front).
3. aqueduct of the cochlea.
4. fenestra vestibuli (in the lateral wall of the vestibule and is closed by the stapes).
5. aqueduct of the vestibule (opens into the floor of the vestibule and transmits the endolymphatic duct).
6. the 3 semicircular canals (behind).

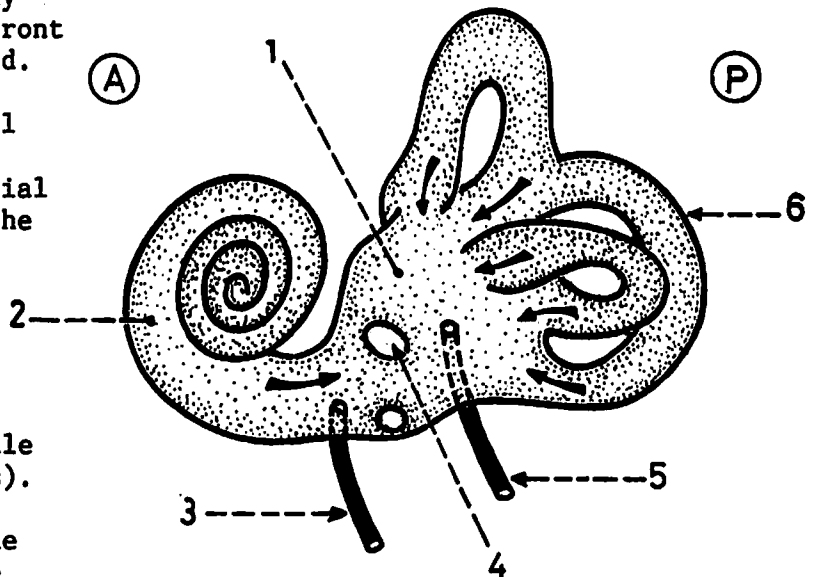


Fig.(736): CONTENTS OF THE VESTIBULE

It contains the saccule and utricle which are the central parts of the membranous labyrinth.

1. saccule (lies close to the base of the cochlea).
2. utricle (larger than the saccule and receives the orifices of the semicircular canals).
3. aqueduct of cochlea.
4. aqueduct of vestibule.
5. dilated end of the endolymphatic duct.

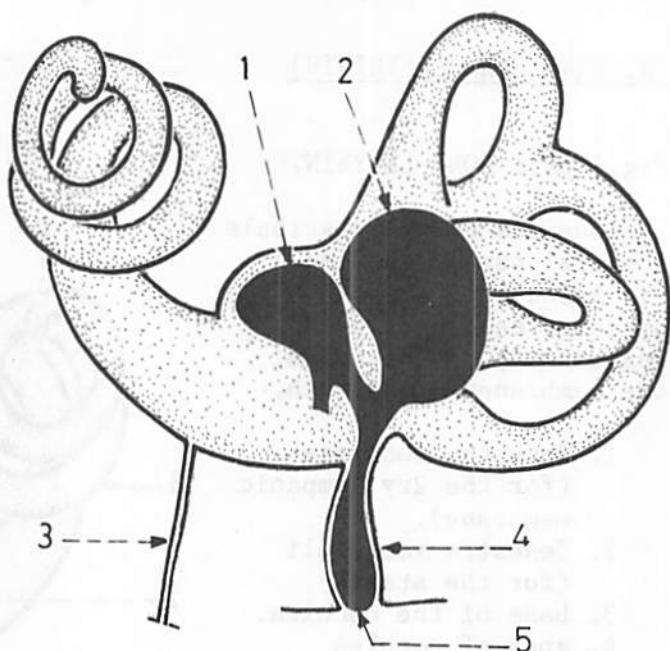


Fig.(737): CONTENTS OF THE COCHLEA

The part of the membranous labyrinth in the cochlea consists of the cochlear duct, scala vestibuli and scala tympani. These 3 tubes are spirally arranged within the turns of the cochlea.

1. cupola (apex) of the cochlea.
2. the 3rd turn of cochlea.
3. the 2nd turn of cochlea.
4. the 1st turn of cochlea (base).
5. cochlear aqueduct.
6. fenestra cochleae.

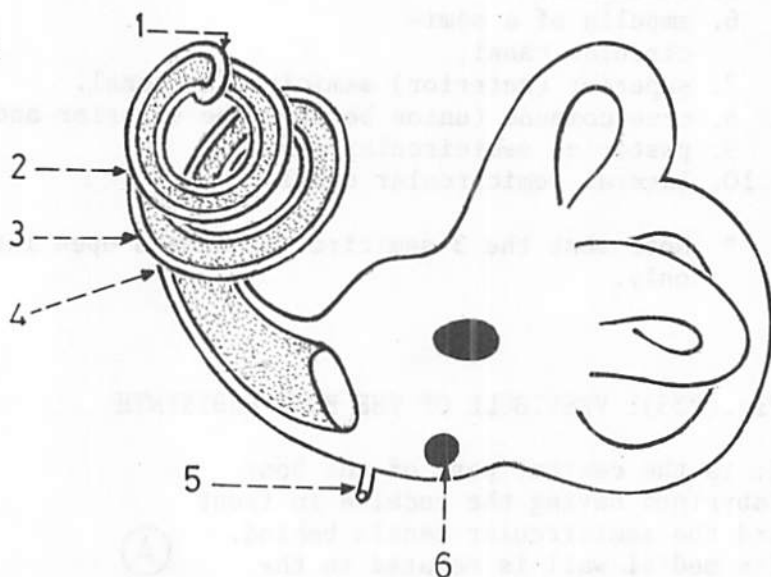
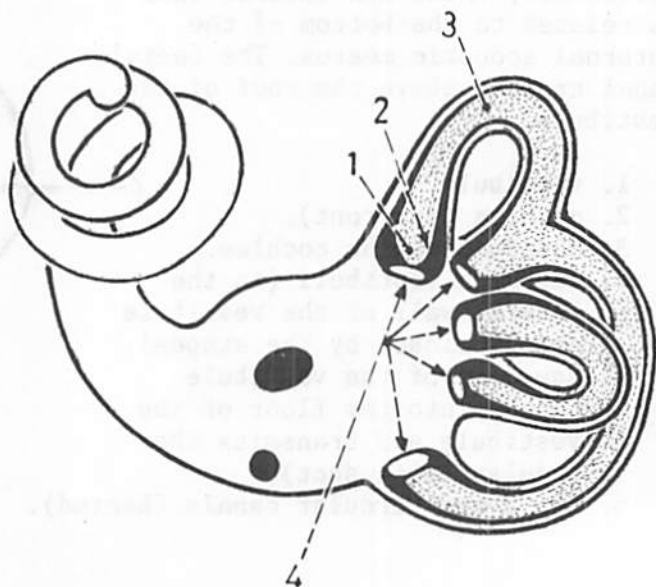


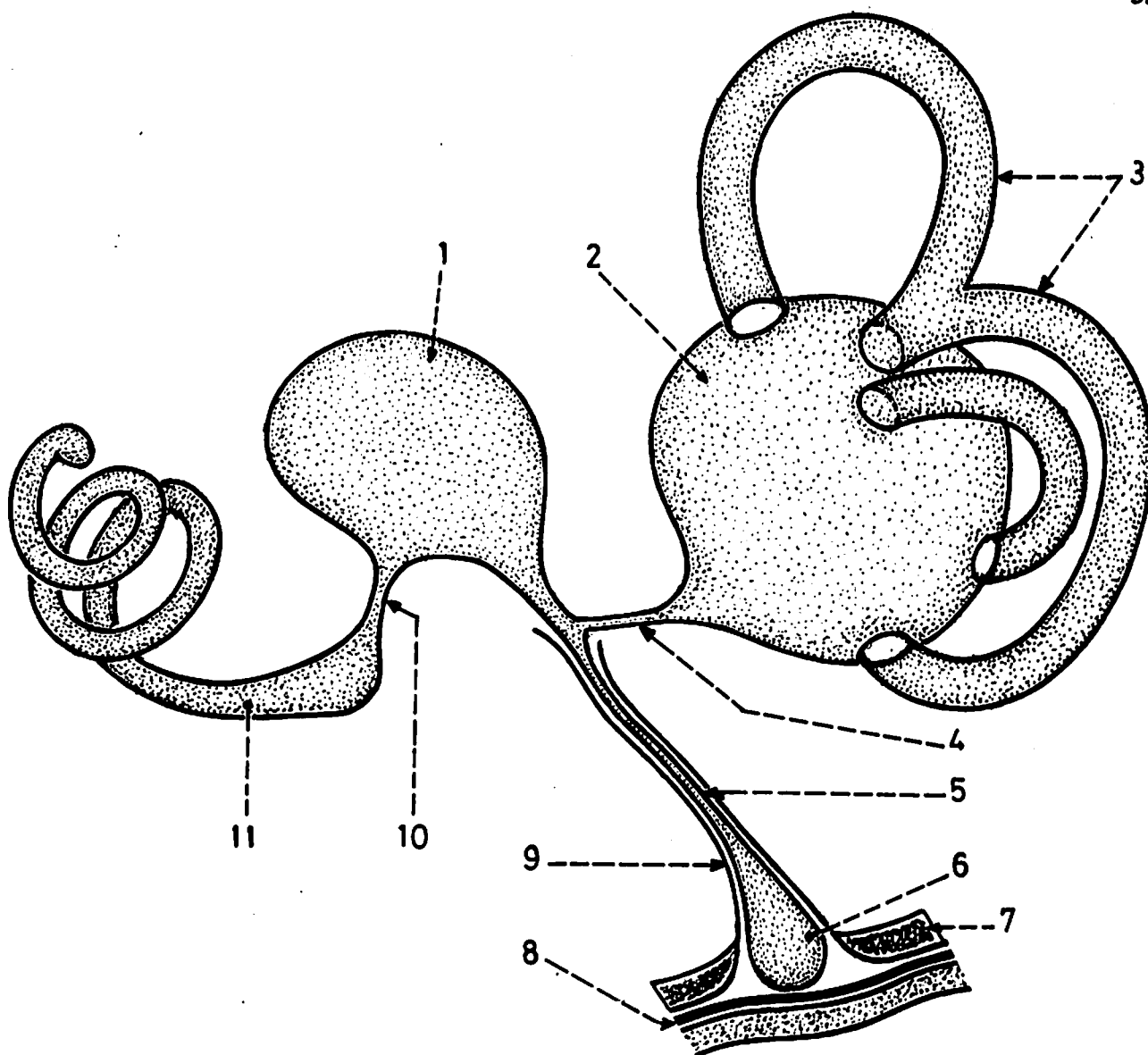
Fig.(738): CONTENTS OF SEMICIRCULAR CANALS

These are the 3 semicircular ducts.

1. ampulla of a semicircular duct.
2. ampullary crest (a thickening in the wall of the ampulla).
3. semicircular duct.
4. the 5 opening of the 3 semicircular ducts.







**Fig.(739): MEMBRANOUS LABYRINTH**

It consists of a number of membranous cavities present within the bony labyrinth. It is filled with endolymph and is separated from the bony labyrinth by the perilymph. It comprises the utricle and saccule (in the vestibule), the cochlear duct (in the cochlea) and the 3 semicircular ducts (in the semicircular canals).

1. saccule (receives the opening of the cochlear duct).
2. utricle (receives the 5 orifices of the semicircular canals).
3. semicircular canals.
4. utriculo-saccular duct (opens into the endolymphatic duct).
5. endolymphatic duct (arises from the saccule and ends blindly in the succus endolymphaticus).
6. succus endolymphaticus (lies under the dura mater on the posterior surface of the petrous temporal bone).
7. posterior wall of petrous temporal bone.
8. dura mater of posterior cranial fossa.
9. aqueduct of vestibule.
10. ductus reuniens (a short segment joining the saccule to the cochlear duct).
11. cochlear duct.

Fig.(740): COCHLEA

It is conical in shape and consists of a central axis termed the modulus around which the canal is spirally placed forming  $2\frac{1}{2}$  turns. This canal comprises the cochlear duct, scala vestibuli and scala tympani.

1. scala vestibuli.
2. cochlear duct.
3. scala tympani.
4. fibres of cochlear division of the auditory nerve.
5. cupola (apex) of the cochlea.
6. base of the cochlea.

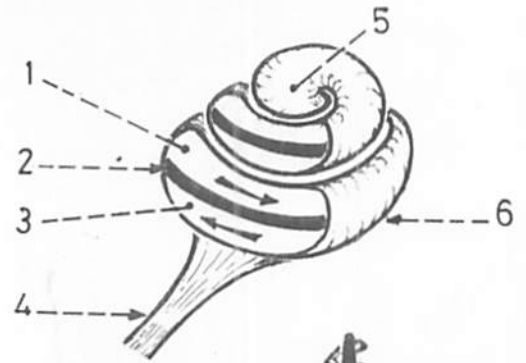


Fig.(741): MODULUS OF THE COCHLEA

1. modulus.
2. spiral bony lamina projecting from the modulus.
3. base of the modulus (perforated by the cochlear branches of the auditory nerve).
4. cochlear branches of the auditory nerve.

\* The modulus is the central pillar of the cochlea and is conical in shape with its base directly related to the bottom of the internal acoustic meatus.

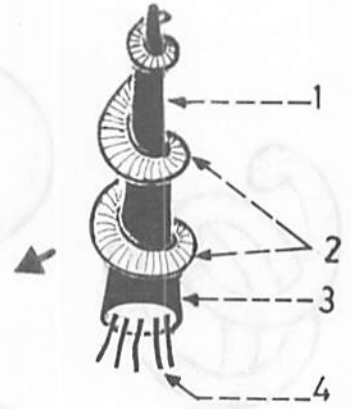
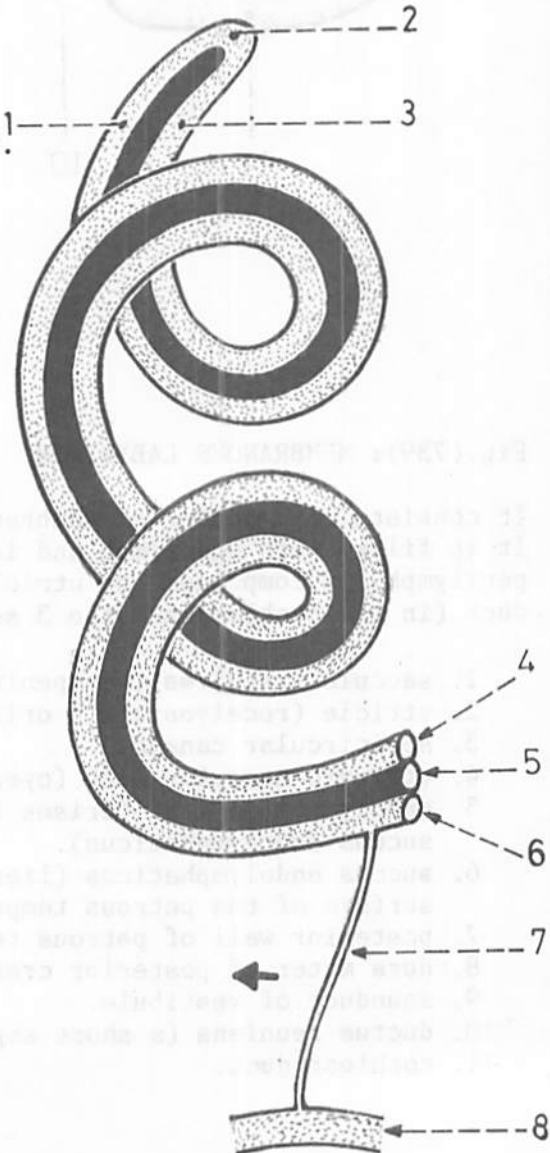


Fig.(742): COCHLEAR DUCT (simplified)

It lies between the scala vestibuli above and the scala tympani below. The 2 scalae communicate together at the helicotrema at the apex of the cochlea.

1. scala tympani.
2. helicotrema (a communication between the scala tympani and scala vestibuli).
3. scala vestibuli.
4. opening of scala vestibuli (communicates with the vestibule).
5. opening of cochlear duct (communicates with the sacculle).
6. opening of scala tympani (closed by the 2nd tympanic membrane).
7. aqueduct of cochlea.
8. subarachnoid space.



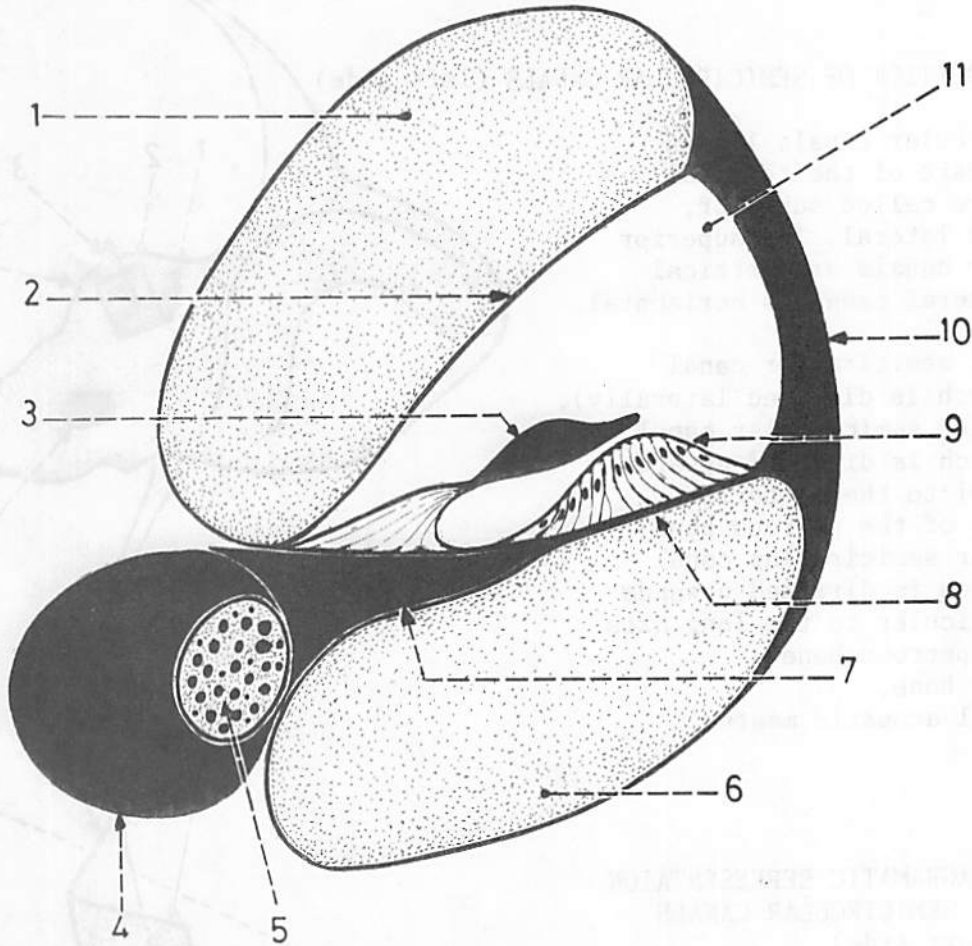


Fig.(743): CONTENTS OF THE COCHLEAR CANAL (T.S.)

These are the cochlear duct, scala vestibuli and scala tympani together with the organ of Corti.

1. scala vestibuli (filled with perilymph).
2. vestibular membrane (separates the scala vestibuli from the cochlear duct).
3. membrana tectoria.
4. modiolus (central bony axis of the cochlea).
5. spiral ganglion (gives rise to the cochlear fibres of the auditory nerve).
6. scala tympani (filled with perilymph and lies below the cochlear duct).
7. spiral bony lamina projecting from the modiolus.
8. basilar membrane (attached to the spiral lamina and separates the scala tympani from the cochlear duct).
9. organ of Corti (the sensory end organ for hearing).
10. wall of the cochlear canal.
11. cochlear duct (part of the membranous labyrinth which contains endolymph).

\* The cochlear duct together with the scala vestibuli and scala tympani are arranged spirally around the modiolus of the cochlea. At the apex of the cochlea, the cochlear duct ends blindly while the scala vestibuli and the scala tympani communicate together through the helicotrema.

Fig.(744): POSITION OF SEMICIRCULAR CANALS (left side)

The 3 semicircular canals lie in the petrous part of the temporal bone. They are called superior, posterior and lateral. The superior and posterior canals are vertical while the lateral canal is horizontal.

1. lateral semicircular canal (its arch is directed laterally).
2. posterior semicircular canal (its arch is directed upwards parallel to the posterior surface of the petrous bone).
3. superior semicircular canal (its arch is directed upwards perpendicular to the long axis of the petrous bone).
4. petrous bone.
5. internal acoustic meatus.

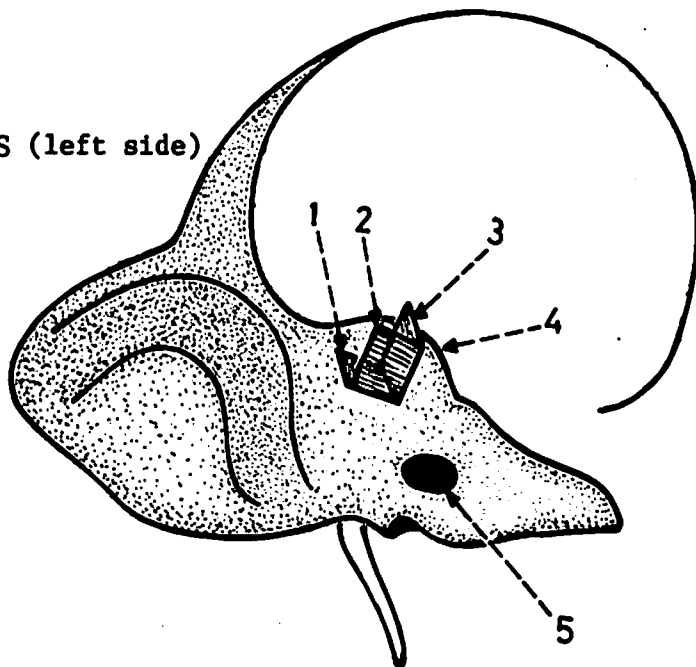


Fig.(745): DIAGRAMATIC REPRESENTATION OF SEMICIRCULAR CANALS (left side)

1. lateral semicircular canal.
2. posterior semicircular canal.
3. superior semicircular canal.
4. petrous temporal bone as seen from behind.

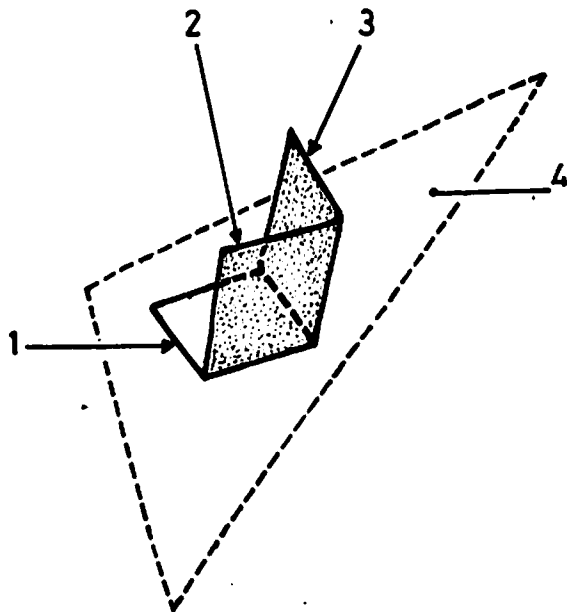


Fig.(746): POSITION OF THE SUPERIOR AND POSTERIOR SEMICIRCULAR CANALS OF BOTH SIDES

The superior semicircular canal of one side lies parallel to the posterior semicircular canal of the other side.

1. superior semicircular canal (left side).
2. posterior semicircular canal (left side).
3. superior semicircular canal (right side).
4. posterior semicircular canal (right side).

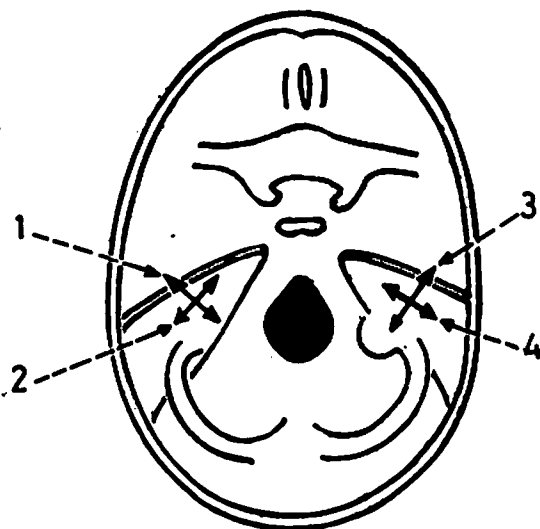


Fig.(747): SEMICIRCULAR CANAL AND DUCT (T.S.)

The semicircular duct is a part of the membranous labyrinth. It is filled with endolymph and forms  $\frac{1}{4}$  of the diameter of the semicircular canal.

1. semicircular duct filled with endolymph.
2. perilymph in the semicircular bony canal.
3. semicircular canal (part of the bony labyrinth).

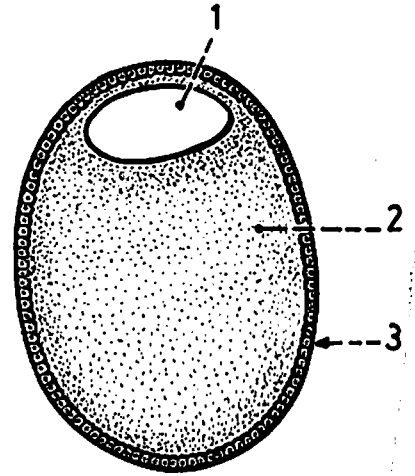


Fig.(748): T.S. IN THE AMPULLA OF THE SEMICIRCULAR CANAL TO SHOW THE AMPULLARY CREST

The ampullary crest is a thickening in the wall of the ampulla. It is the sensory end organ concerned with equilibrium and is supplied by vestibular fibres.

1. cupula (a gelatinous mass on the top of the crest).
2. ampullary crest.
3. vestibular fibres.
4. endolymph in the semicircular duct.
5. wall of the semicircular duct.
6. perilymph in the semicircular canal.
7. wall of the semicircular canal.

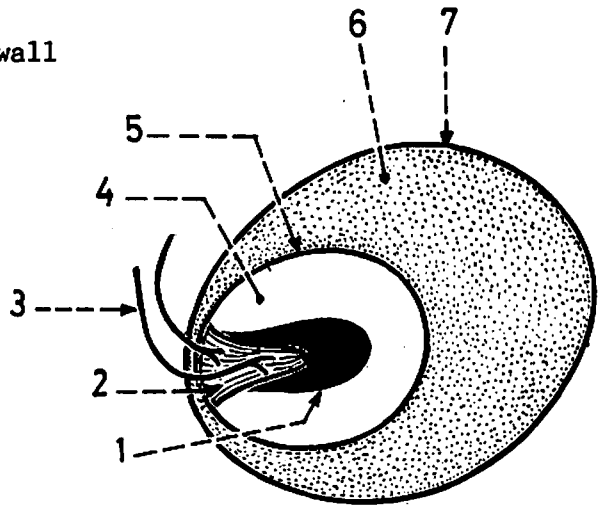


Fig.(749): SENSORY END ORGANS OF EQUILIBRIUM

These are the ampullary crests of the semicircular canals, macula of the utricle and macula of the saccule.

1. maculae of saccule and utricle (thickened areas covered by gelatinous substance).
2. ampullary crest.
3. utricle.
4. saccule.

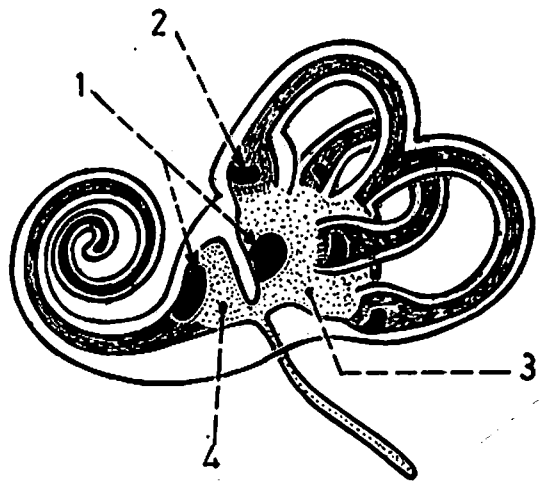
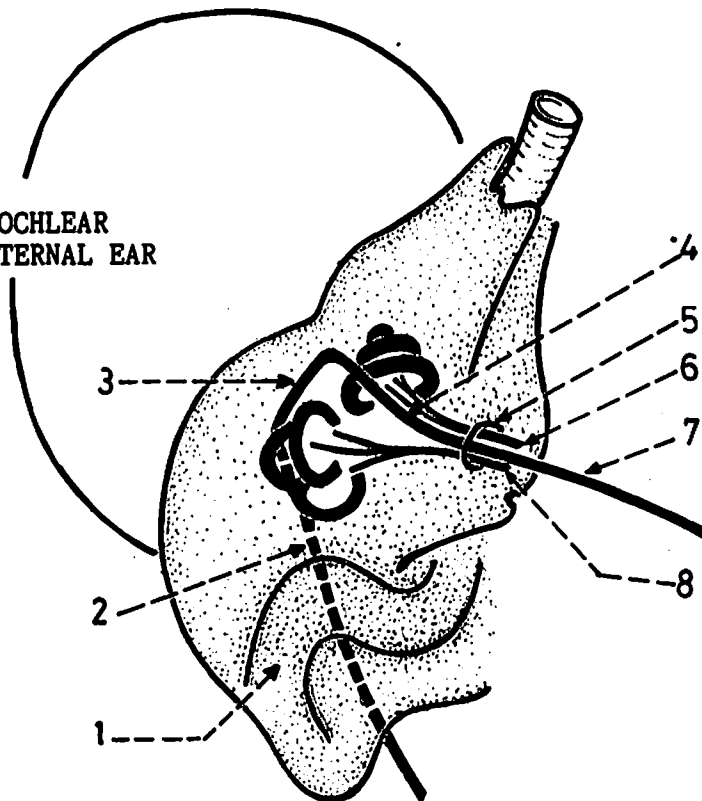


Fig.(750): RELATIONS OF THE VESTIBULOCOCHLEAR AND FACIAL NERVES TO THE INTERNAL EAR

These nerves pierce the bottom of the internal acoustic meatus. The facial nerve enters the facial canal which runs laterally above the vestibule of the internal ear to reach the medial wall of the middle ear. The cochlear division of the auditory nerve supplies the cochlea, while the vestibular division supplies the semicircular ducts, utricle and saccule.



1. petrous part of temporal bone.
2. vertical part of facial canal.
3. horizontal part of facial canal in the middle ear.
4. part of the facial canal above the roof of the vestibule of the internal ear.
5. bottom of the internal acoustic meatus.
6. cochlear division of auditory nerve.
7. facial nerve.
8. vestibular division of auditory nerve.

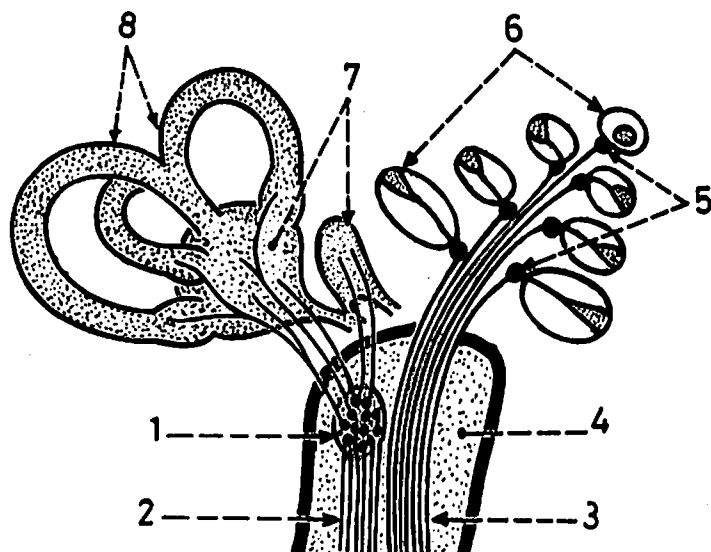


Fig.(751): VESTIBULOCOCHLEAR NERVE

1. vestibular ganglion (lies in the bottom of the internal acoustic meatus).
2. vestibular division of auditory nerve.
3. cochlear division of auditory nerve.
4. internal acoustic meatus.
5. part of the spiral ganglion in the cochlea.
6. turns of the cochlea in section.
7. saccule and utricle.
8. semicircular ducts.

Fig.(752): POSITION OF THE SPIRAL GANGLION

It lies in the spiral lamina at its junction with the modulus.

1. spiral ganglion (runs spirally).
2. bony spiral lamina.
3. modulus.

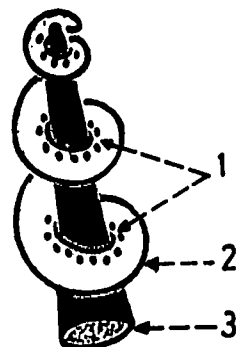
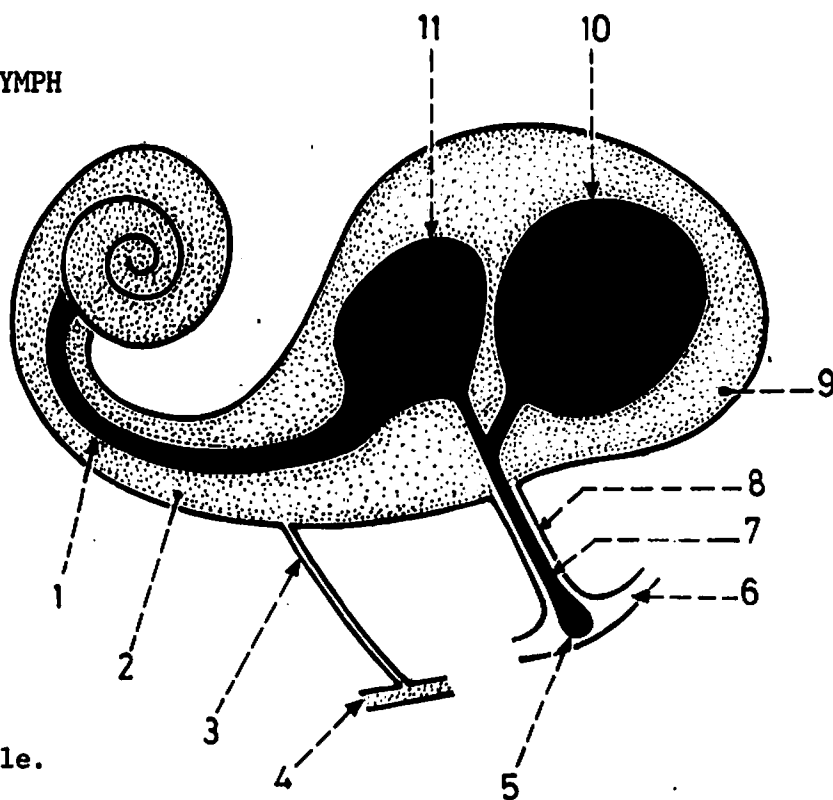


Fig.(753): ENDOLYMPH AND PERILYMPH

The endolymph fills the membranous labyrinth which is a closed system, while the perilymph lies in the bony labyrinth and communicates with the subarachnoid space through the aqueduct of cochlea.

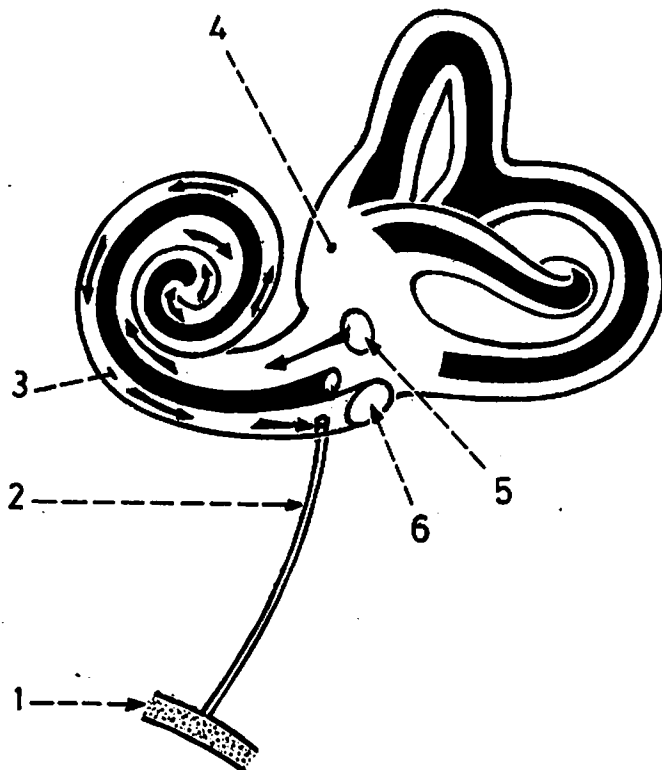


1. cochlear duct.
2. perilymph.
3. aqueduct of cochlea.
4. subarachnoid space.
5. saccus endolymphaticus.
6. dura mater.
7. ductus endolymphaticus.
8. aqueduct of vestibule.
9. perilymph in the vestibule.
10. utricle.
11. saccule.

\* The semicircular canals are not shown in the figure.

Fig.(754): DIRECTION OF THE SOUND WAVES IN THE COCHLEA

Vibrations of the auditory ossicles are transmitted to the fenestra vestibuli and then to the perilymph of the vestibule. Sound waves pass through the scala vestibuli where they move the vestibular membrane. At the helicotrema the sound waves return in the scala tympani to end at the 2nd tympanic membrane.



1. subarachnoid space.
2. cochlear aqueduct.
3. scala tympani.
4. vestibule.
5. fenestra vestibuli.
6. fenestra cochleae.

# EYEBALL

Fig.(755): COATS OF THE EYEBALL

The eyeball has 3 coats: fibrous coat (cornea and sclera), vascular pigmented coat (choroid, ciliary body and iris) and nervous coat (retina).

1. iris.
2. ciliary body.
3. choroid (highly vascular layer just deep to the sclera).
4. retina (innermost layer).
5. sclera (outermost layer).
6. optic nerve.
7. lamina cribrosa (thin posterior part of the sclera which is perforated by the fibres of the optic nerve).
8. lens.
9. cornea (anterior transparent part of the outer coat).

\* The cornea is devoid of blood and lymph vessels.

\* The thin lamina cribrosa may bulge posteriorly in case of increased intra-ocular pressure producing a condition called cupped disc.

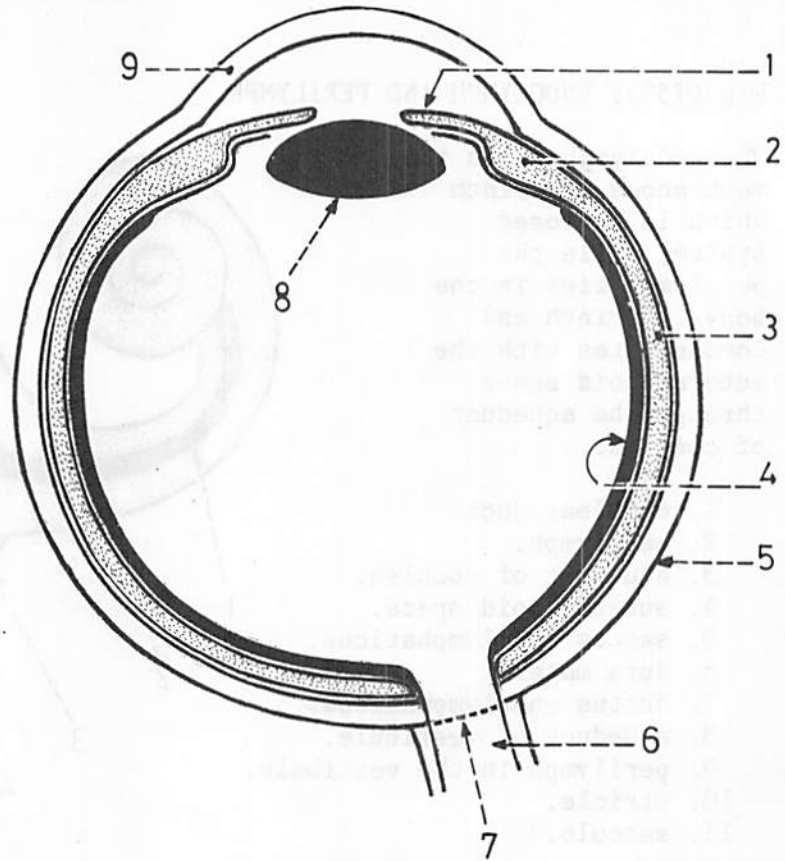


Fig.(756): CONTENTS OF THE EYEBALL

These are the aqueous humour, lens and vitreous body.

1. suspensory ligament of the lens.
2. ciliary body.
3. ciliary zonule (thickened anterior part of hyaloid membrane).
4. hyaloid membrane.
5. hyaloid canal (empty).
6. vitreous body (gel-like).
7. aqueous humour in the anterior chamber.
8. lens.

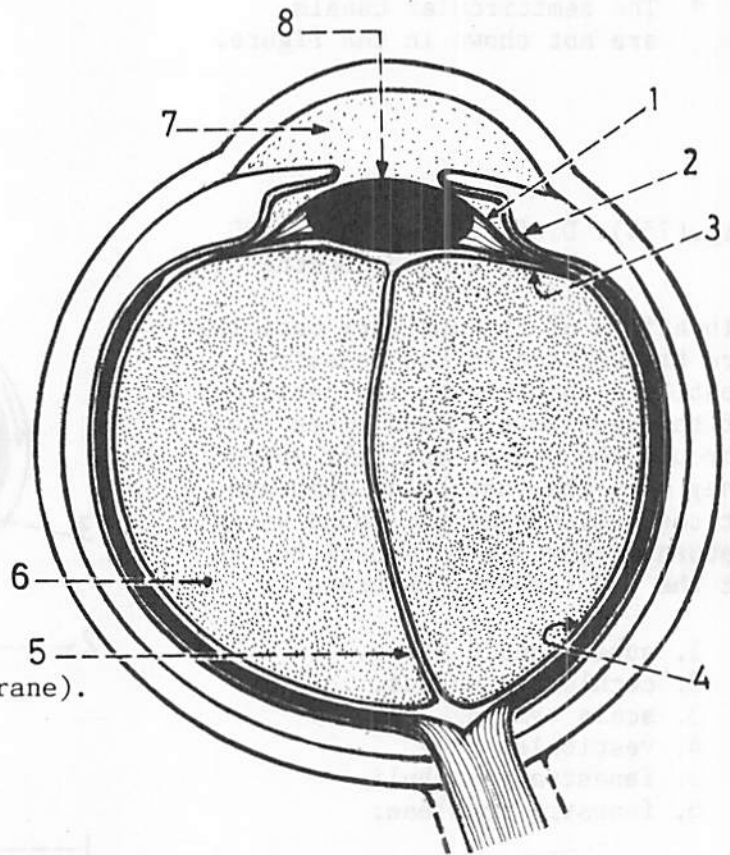




Fig.(757): CHAMBERS OF THE EYEBALL AND FLOW OF AQUEOUS HUMOUR

The anterior chamber lies between the iris and cornea, while the posterior chamber lies between the iris and lens.

The aqueous humour passes from the posterior chamber to the anterior chamber through the pupillary aperture of the iris. It enters the sinus venosus sclerae at the sclero-corneal junction.

1. lens.
2. posterior chamber.
3. anterior chamber.
4. iris.
5. sinus venosus sclerae.

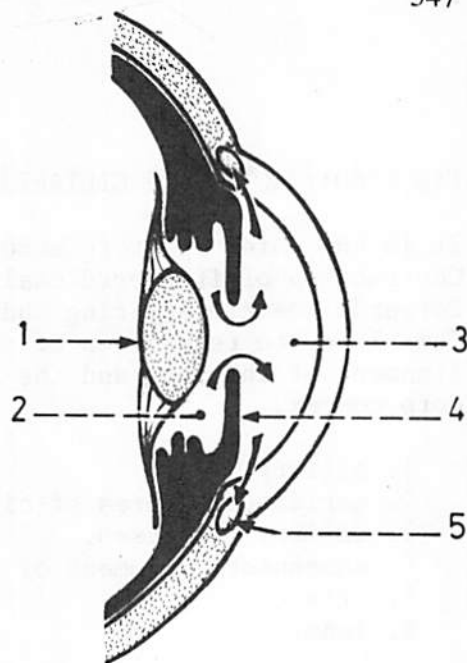


Fig.(758): IRIS

It is a thin circular disc which is attached by its periphery to the ciliary body. Its centre is perforated by the pupil.

1. dilator pupillae muscle of the iris.
2. sphincter pupillae muscle of the iris.
3. pupil.

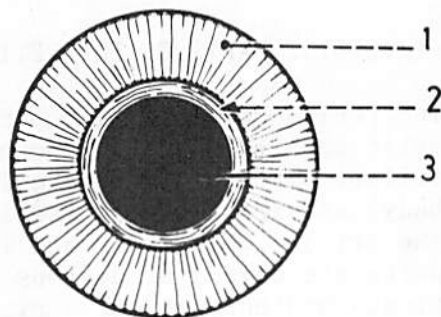


Fig.(759): CILIARY BODY

It consists of the ciliary ring, ciliary processes and ciliaris muscle.

1. lens.
2. suspensory ligament of the lens (anterior extension of the hyaloid membrane which is attached to the capsule of the lens).
3. ciliary processes (lie in front of the suspensory ligament of the lens to which they are fixed).
4. ciliary ring (lies at the anterior end of the choroid and gives rise to the ciliary processes).
5. meridional fibres of ciliaris muscle (extend backwards from the anterior edge of the sclera to the ciliary ring).
6. circular fibres of ciliaris muscle (lie just behind the irido-corneal angle).
7. iris.

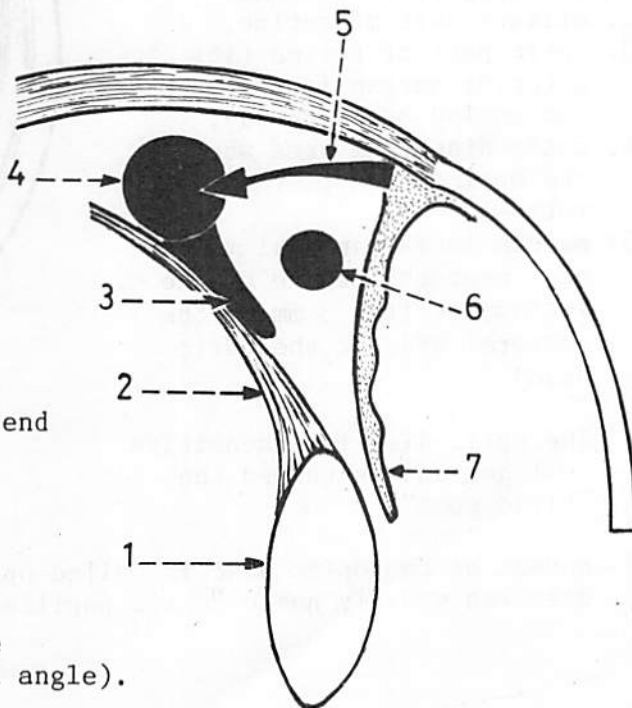


Fig.(760): ACTION OF CILIARIS MUSCLE

It is the chief agent in accommodation. Contraction of its meridional fibres draws forwards the ciliary ring and processes. This leads to relaxation of the suspensory ligament of the lens and the lens becomes more convex.

1. ciliary ring.
2. meridional fibres of ciliaris muscle.
3. ciliary processes.
4. suspensory ligament of the lens.
5. iris.
6. lens.

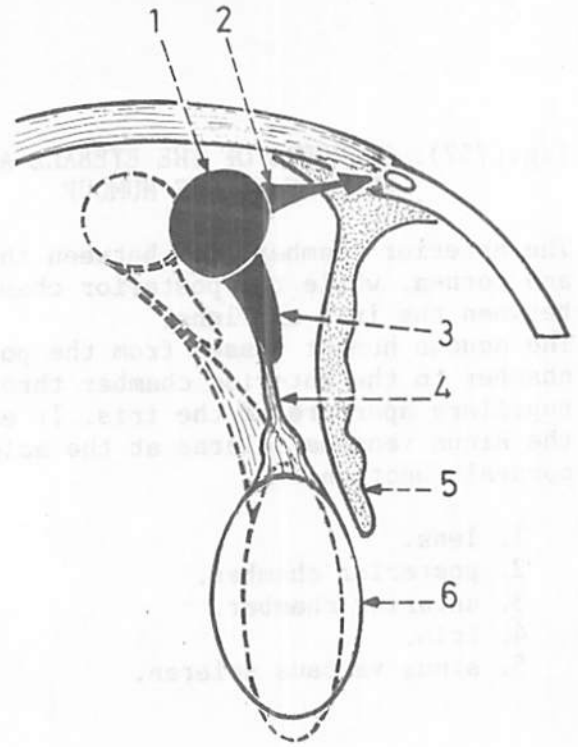


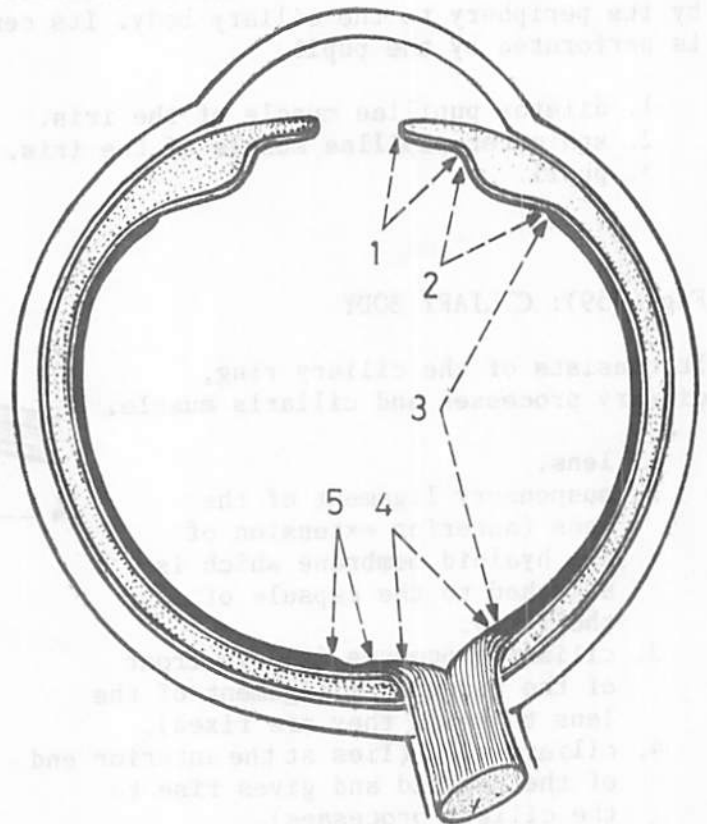
Fig.(761): PARTS OF THE RETINA

The retina consists of 3 parts: optic part (lining the choroid), ciliary part (behind the ciliary body) and iridal part (behind the iris). The ciliary and iridal parts are devoid of nervous tissue and consist of a pigmented layer.

1. iridal part of retina.
2. ciliary part of retina.
3. optic part of retina (its anterior margin is serrated and called ora serrata).
4. optic disc (the area where the optic nerve pierces the retina).
5. macula lutea (an oval yellow area near the centre of the retina; it lies 3 mm to the temporal side of the optic disc).

\* The optic disc is insensitive to light and is termed the "blind spot".

\* oedema of the optic disc is called optic papilloedema because the optic disc was wrongly named "optic papilla".



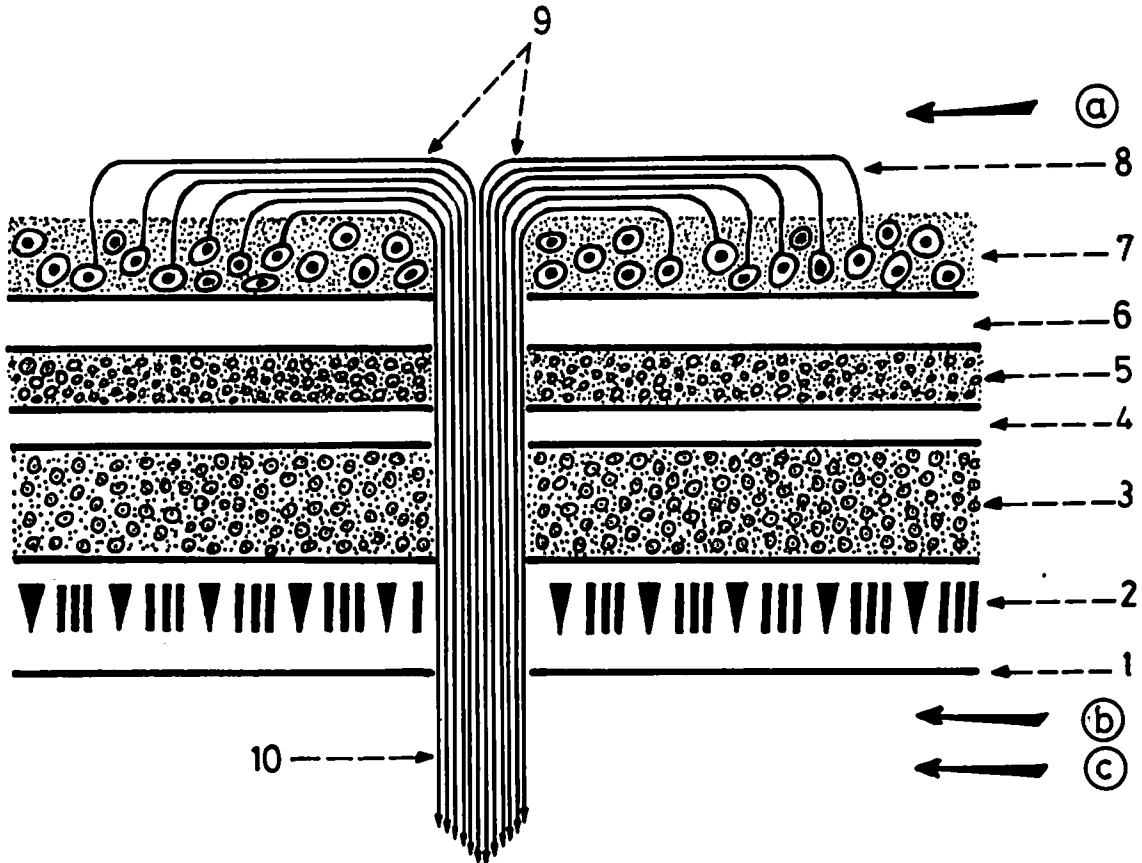


Fig.(762): MAIN LAYERS OF THE RETINA

1. pigmented layer of the retina (just deep to the choroid).
2. layer of rods and cones.
3. outer nuclear layer.
4. outer plexiform layer.
5. inner nuclear layer.
6. inner plexiform layer.
7. ganglionic layer.
8. stratum opticum (layer of fibres of the optic nerve).
9. area of optic disc (where the nerve fibres collect to form the optic nerve).
10. fibres of optic nerve.

- (a) position of the vitreous body.  
 (b) position of the choroid.  
 (c) position of the sclera.

Fig.(763): VENAE VORTICOSAE

These are whorl-like veins present in the choroid. Each whorl gives rise to a vein which pierces the sclera midway between the optic disc and the sclerocorneal junction.

